Mi:Node Kit 使用手冊

Make creative ‘things’ with micro:bit

Revision	Date	Description
V0.1.0	March 2017 by Paul	Initial version

TOC

介紹

Mi：Node kit 是一個模塊化，安全且易於使用的項目，可讓孩子們盡量減少 Micro：bit 進行 IOT 學習所需的工作量。

對於該套件，不需要焊接，只需要用連接線接插頭然後使用，工作電路的設計可以在一分鐘內完成。

Introduction

The Mi:Node kit is a modular, safe and easy to use group of items that allow kids to minimize the effort required to get started with IOT learning with Micro:bit.

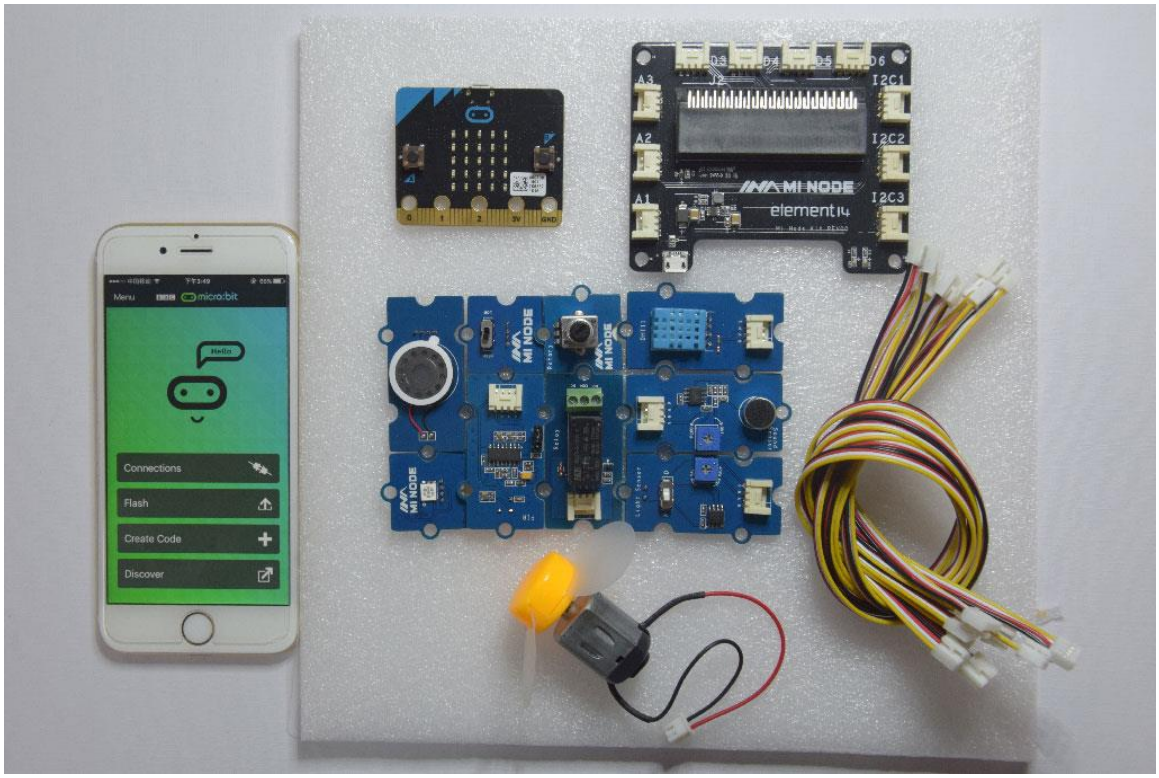
For this kit, there is no need for soldering, plug then use, the construction of the working circuit can be done within one minute.

特徵

- 像 Lego 一樣，它是模塊化，安全和即用的
- 10 個傳感器模塊包括環境監控，用戶界面和物理監控可以建立很多酷炫的項目，包括可穿戴設備和智能家居等。
- 可擴展和可重用
- 豐富的教育指導文件和許多項目故事

Features

- It is modular, safe and ready-to-use just like Lego
- 10 sensor modules include environmental monitoring, user interface and physical monitoring can be built a lot of cool projects include wearable device and smart home, etc.
- It is expandable and reusable
- Rich education guide document and many project stories



What is the Kit?

What is it include?

Category	Module	Quantity	Conector Type	Description
Micro:bit	Micro:bit Main Board	0	NA	The Micro:bit is not include in the kit
Connect Board	Connect Board	1	NA	This a bridge between the micro:bit and sensor modules
Sensor Module (10)	Light Sensor	1	Analog Input	It can be used to detect the intensity of light in the environment
	Temperature and Humidity Sensor	1	Analog Input	It can get temperature and humidity in the environment
	Sound Sensor	1	Analog Input	It can detect the sound strength of the environment
	Rotary Angle	1	Analog Input	It can produce analog output between 0 and

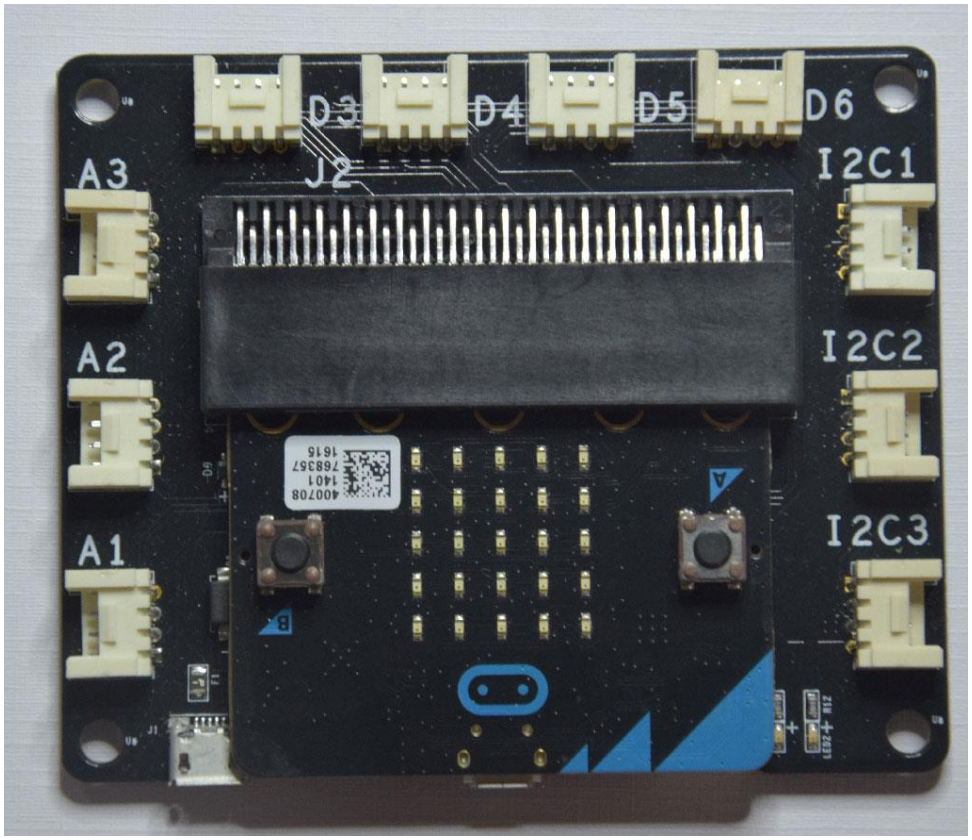
				Vcc by adjust the angular range from 0 ~ 300.
	Mini Fan	1	Analog Output/PWM	A DC motor + orbit fan
	Speaker	1	Analog Output/PWM	Voice output speaker
	PIR Motion Sensor	1	Digital Input	It allows user to sense motion, usually human movement in its range
	RGB LED	1	Digital Output	A colorful LED. The color and brightness can be programable
	Switch	1	Digital Input	It can used to switch ON/OFF
	Relay	1	Digital Output	It is an digital switch can be used to control high-votage elecrical devices. (maximum 250V)
Cables	Universal 4 Pin Buckled Cable	8	NA	20cm cable x 2, 10cm cable x 6
	Micro-B USB cable	2	NA	1 for power input, 1 for micro:bit program upload

怎麼運行的

該套件由連接板和多個傳感器模塊組成。 連接板是微位置主板和傳感器模塊之間的橋樑。 它將微位置連接器轉換為服務器 E-brick 連接器。 傳感器模塊可以通過電纜連接到它。

How it works

The kit is composed of a connect board and several sensor modules. The connect board is a bridge between the micro:bit main board and the sensor modules. It converts the micro:bit edge connector into serveral E-brick connector. The sensor modules can be attached to it by cable.



E-brick Connector

E-brick 連接器與 Seeed 的標準 Grove 兼容。 它是 2.0mm 1x4 連接器。 信號包括：1 VCC，1GND，2 個模擬/数字信號。

一個 E-brick 連接器有 4 個引腳：

E-brick Connector

The E-brick connectors are compatible with the standard Grove from Seeed. It¡¯s a 2.0mm 1x4 connector. With signals include: 1 VCC, 1GND, 2 analog / digital signal.

An E-brick connector have 4 pins:

Pin ID	Pin Name	Description
Pin#1	Signal#1	Connect to a micro:bit pin with analog in / digital io / i2c function
Pin#2	Signal#2	Same to Signal#1. The Signal#2 is often not used, because 1 signal pin is enough for most sensor modules
Pin#3	VCC	Power pin

Pin#4 GND Power pin

連接器有 3 種類型：

•3 個模擬輸入連接器

•3 個 I2C 連接器

•4 個數字 IO 連接器

There are 3 types of the connector:

- 3 analog input connectors
- 3 I2C connectors
- 4 digital IO connectors

E-brick Connector - Analog In/PWM Type

Pin ID	Pin Name	Remark
Pin#1	A1	Connect to a micro:bit pin with analog input/PWM function
Pin#2	A2	Same to A1, but most sensor module may not use the A2 pin

E-brick Connector - Digital IO Type

Pin ID	Pin Name	Remark
Pin#1	D1	Connect to a micro:bit pin with digital io function
Pin#2	D2	Same to D1, but most sensor module may not use the D2 pin

E-brick Connector - IIC Type

IIC (Inter-Integrated Circuit), 發音為 I-squared-C 是由飛利浦半導體（現在的恩智浦半導體）發明的多主機(master)，多從機(slave)，單端，串行計算機總線。 它通常用於在短距離，板內通信中將低速外設連接到微控制器。

有一些基於 IIC 總線的傳感器模塊。 我們可以在相同的總線上附加服務器模塊，因為它們可以被不同的地址識別。

IIC (Inter-Integrated Circuit), pronounced I-squared-C, is a multi-master, multi-slave, single-ended, serial computer bus invented by Philips Semiconductor (now NXP Semiconductors). It is typically used for attaching lower-speed peripheral to microcontrollers in short-distance, intra-board communication.

There are some sensor modules based on the IIC bus. We can attach serveral modules on the same bus, Because they can be identificated by different addresses.

Pin ID	Pin Name	Remark
Pin#1	IIC SCL	IIC clock signal. Connect to micro:bit pin19
Pin#2	IIC SDA	IIC data signal. Connect to micro:bit pin20

Conversation on Remaping Micro:bit Edge Pin

請注意連接器名稱。 連接器名稱中有約定。 連接器名稱可以指示映射的微：位信號名稱。

例如：連接器 D12 表示：信號＃1 被重新映射到 micro:bit 引腳 12，信號＃2 被重新映射到 micro:bit 引腳 13（12 + 1）

在開發代碼時，我們可以快速定位 micro：bit 引腳

Please note the Connector Name. There is a convention in the connector name. A connector name can be indicated the mapped micro:bit signal name.

For example: Connector D12 means: The Signal#1 is remapped to micro:bit pin 12, and Signal#2 is remapped to micro:bit pin 13(12+1)

It's useful for us to position the micro:bit pin quickly when develop code.

Connector Type	Connector Name	Micro:bit Pin Name(Signal#1, Signal#2)
Analog Input /	A0	pin0, pin1
Digital IO	A1	pin1, pin2
	A2	pin2, pin3
Digital IO	D12	pin12, pin13
	D13	pin13, pin14
	D14	pin14, pin15
	D15	pin15, pin16
IIC	IIC	pin19, pin20
	IIC	pin19, pin20
	IIC	pin19, pin20

- 我們通常使用 A0，A1，A2 作為模擬輸入連接器，但也可以用作數字 io 連接器。
- D12，D13，D14，D15 只能用作數字 IO 連接器。

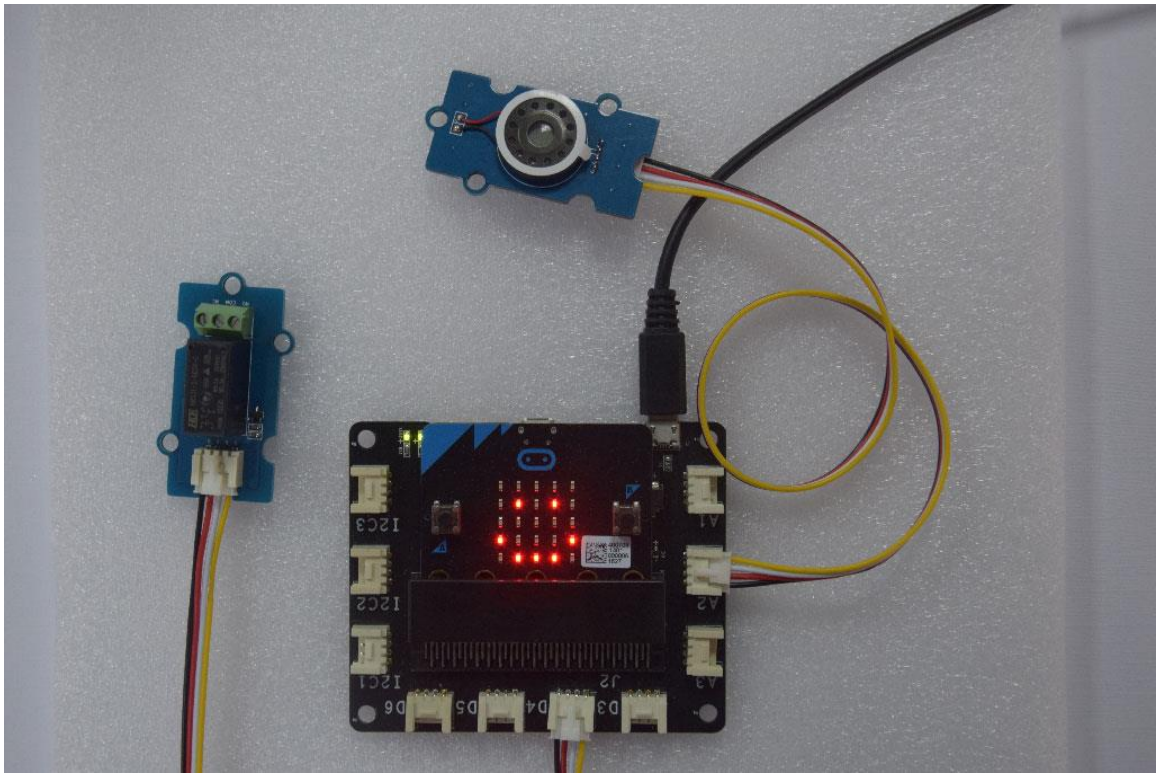
- 3 IIC 只能用作 IIC 連接器。

- We usually use A0, A1, A2 as a analog input connector, but it can also be used as a digital io connector.
- D12, D13, D14, D15 can be only used as digital IO connector.
- 3 IIC can be only used as IIC connector.

How to use it

只需用連接線插入插頭然後使用它，這很容易。

Just plug then use it, That's easy.



Programming with the kit

As you know, There are 5 editors we can chose on micro:bit official website.

- Microsoft PXT

- Code Kingdoms JavaScript
- Microsoft Block Editor
- Microsoft Touch Develop
- python

We'll focus more on the **Microsoft PXT**.

Work with our library

我們將開發傳感器模塊的庫。 這可以減少您使用模塊的工作量。您不必學習模塊的技術細節。 例如，RGB LED 基於 IIC 總線，我們只需要調用庫函數來控制顏色和亮度。 我們不在乎 IIC 本身。

使用庫，您不需要關心模塊連接到哪個引腳，您只需要知道使用了 E-brick 連接器。

We'll develop the libraries for the sensor modules. This can reduce your effort on using the modules.You don't have to study the technical details of the modules. For example, The RGB LED is based on the IIC bus, We just need to call the library function to control the color and brightness. We don't care the IIC bus itself.

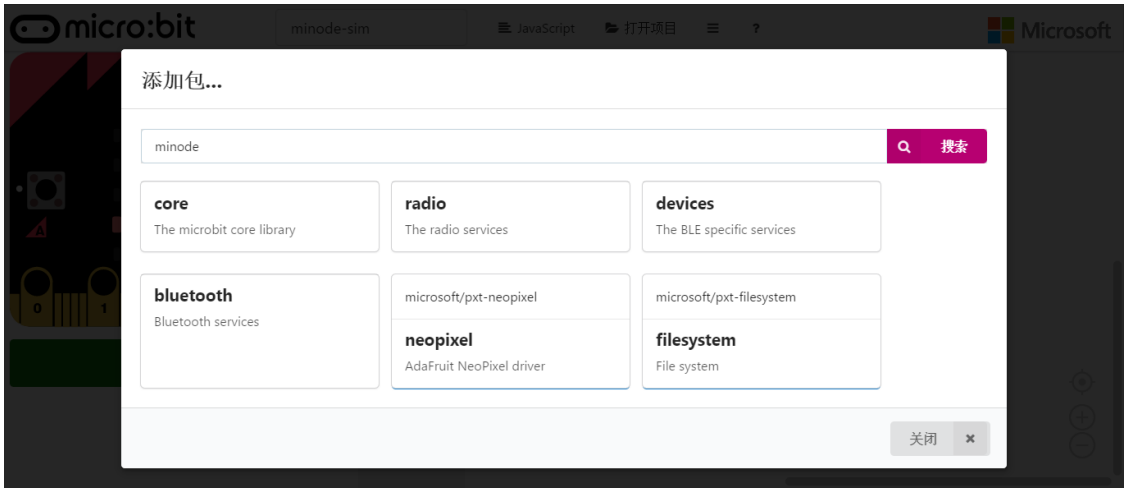
With the library, you don't need to care which pin a module connects to, You just need to know what E-brick connector is used.

NOTE

The library is based on Microsoft PXT.

Steps

- Step 1: Add our library to your code
- Step 2: Refer to the API reference or example code
- Step 3: Drag the library blocks.



Work without our library

您還可以使用 micro：bit 引腳庫直接控制傳感器模塊。 在這種情況下，我們可以通過 E-brick 連接器 ID 獲取 micro：bit 引腳 ID。 例如，我們將傳感器模塊連接到 D12。 然後我們可以得到相應的 Micro：bit 引腳為 pin12。

You can also use the micro:bit pin library to control the sensor modules directly. In this situation, We can get the micro:bit pin ID by the E-brick connector ID. For example, We connect a sensor module to `D12`. Then We can get that the corresponding Micro:bit pin is `pin12`.

Modules Usage & API Reference

Light Sensor

光傳感器模塊可用於檢測環境中的光強度。將亮度分為 5 級。該模塊只能插入**類比連接器（A0，A1 和 A2）。**

The Light Sensor module can be used to detect the intensity of light in the environment.We divide the brightness into 5 levels.This module can only be pluged into **Analog connector(A0, A1 and A2)**.

Module	Connect Type	Available Connectors
Light Sensor	Analog	A0, A1, A2

Block API

Get the light level

獲得當前的光照水平，我們將光強度分為 5 個等級，從 1 到 5.其中 1 表示最亮，5 表示黑暗。

Get current light level, we divide the light intensity into 5 levels,from 1 to 5.which 1 represents brightest and 5 represents darkness.


```
function LightSensorGetLevel(connName: AnalogConnName): number;
```

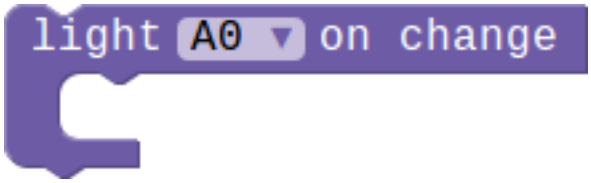
Parameters

- **connName** is the analog connector's name.this module can only be pluged into analog connector A0,A1 and A2.

Light Sensor event

配置 MCU 定期檢查光級別，然後在光級別更改時執行相關的代碼塊。

Configure the MCU check the light level periodically, and then execute the associated code block whenever the light level changes.




```
function onLightSensorEvent(connName: AnalogConnName, body: () => voi
d): void;
```

Parameters

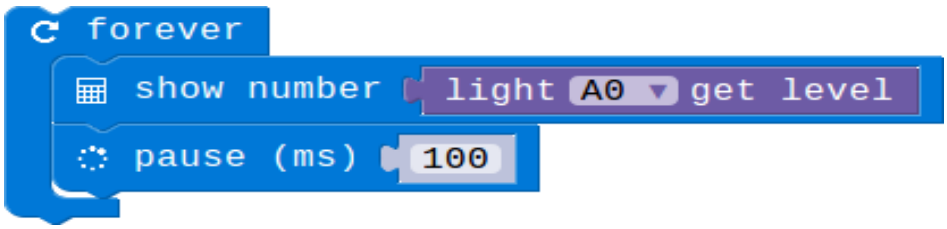
- **connName** is the analog connector's name.this module can only be pluged into analog connector A0,A1 and A2.

Example

Show the light level

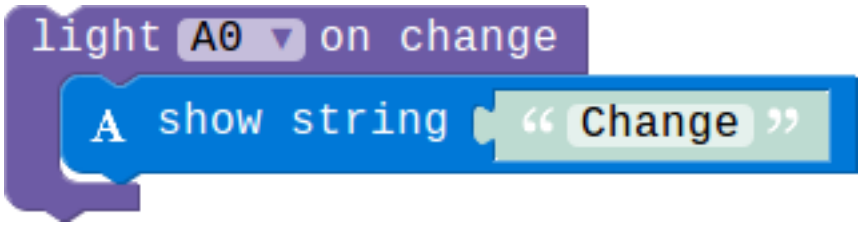
此示例顯示如何獲取當前的燈光級別，並將其顯示在 LED 屏幕上。

This example show you how to get the current light level,and show it on the LED screen.



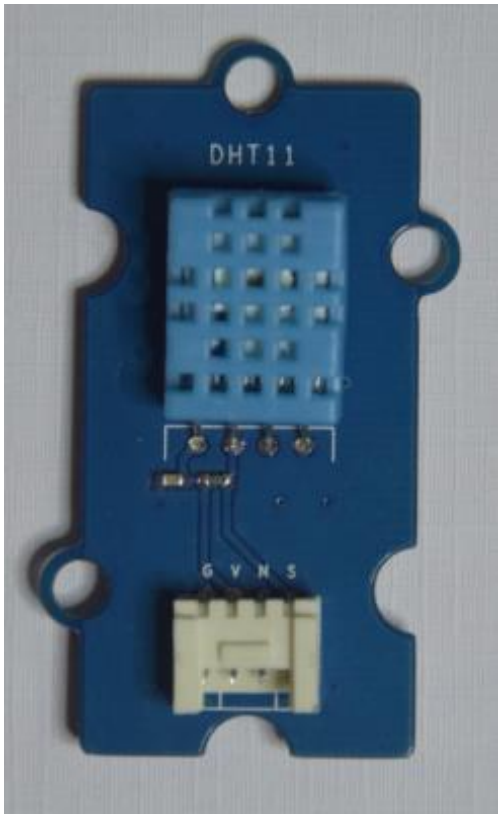
Light level change event

When the light level changes there will show a string on the screen.



DHT11(Temperature and Humidity Sensor)

This DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. It can get temperature and humidity in the environment



Module	Connect Type	Available Connectors
DHT11	Digital IO	D12, D13, D14, D15

TODO

Need hardware engineers to confirm this module's specific parameters.

Module	Measurement Range	Humidity Accuracy	Temperature Accuracy
DHT11	20-90%RH / 0-50 ℃	±5％RH	±2℃

Block API

Get the temperature

獲取當前溫度，您可以配置溫度的格式，以攝氏或華氏為單位。

Get current temperature, you can configure the format of the temperature in Celsius or Fahrenheit.

function DHTGetTemperature(connName: ConnName, style: DHTTemStyle): number;

Parameters

- **connName** is the connector's name.this module can be pluged into both analog connector and digital connector.
- **style** is the format of the temperature.you can choose Celsius or Fahrenheit.

Get humidity

獲得當前濕度。

Get current humidity.


```
function DHTGetHumidity(connName: ConnName): number;
```

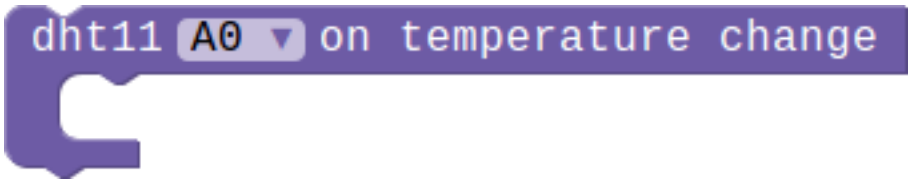
Parameters

- **connName** is the connector's name.this module can be pluged into both analog connector and digital connector.

Temperature change event

配置 MCU 定期檢查溫度，然後在溫度變化時執行相應的代碼塊。最小單位變化為 1 攝氏度。

Configure the MCU check the temperature periodically, and then execute the associated code block whenever the temperature changes.The smallest unit of changing is 1 degrees Celsius.




```
function onDHTEvent(connName: ConnName, body: () => void): void;
```

Parameters

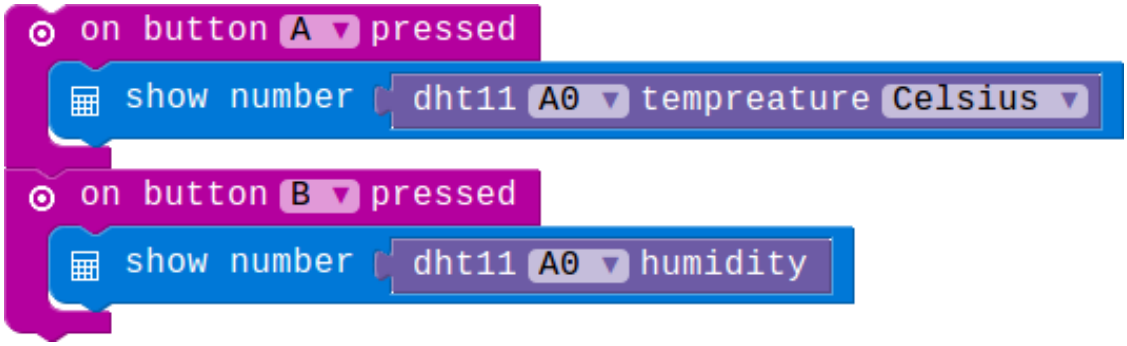
- **connName** is the analog connector's name.this module can be pluged into both analog connector and digital connector.

Example

Use button to get the temperature and humidity

此示例顯示如何使用按鈕 A 和 B 獲取溫度和濕度。當您按下按鈕 A 時，屏幕將顯示當前溫度，如果按鈕為 B，則顯示濕度

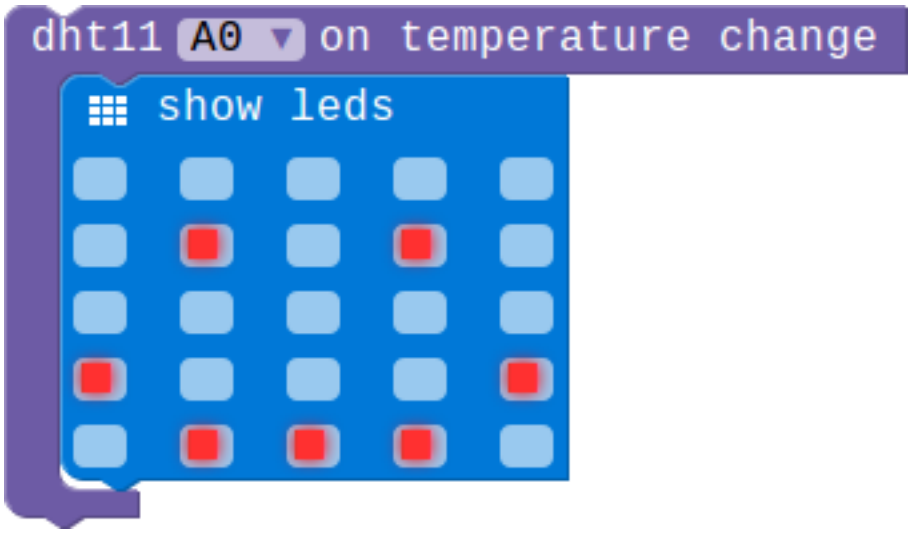
This example show you how to use the button A and B to get the temperature and humidity.When you press the button A the screen will show the current temperature,if the button is B it will show the humidity.



Temperature change event

當溫度變化時，屏幕會顯示笑臉！

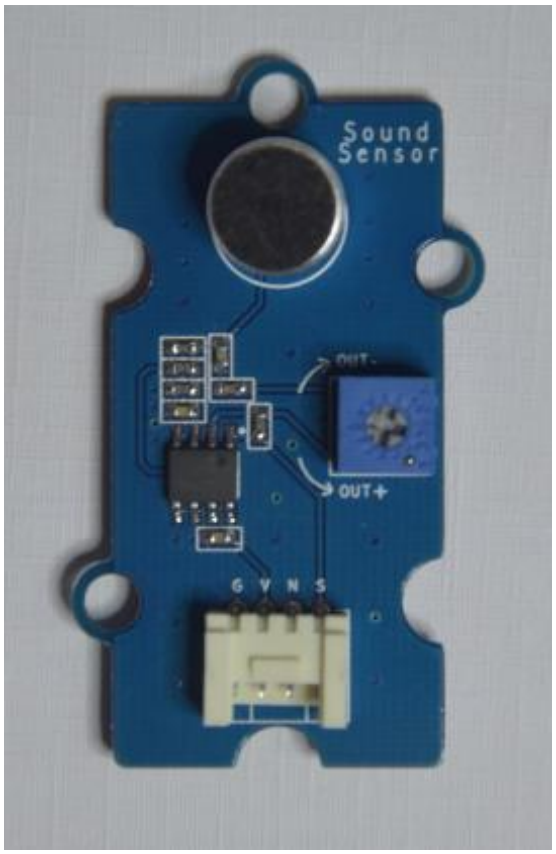
When the temperature changes the screen will show a smile face!



Sound Sensor

聲音傳感器模塊可用於檢測環境的聲音強度。 我們將聲音分為 5 個等級，您可以使用我們的塊獲取當前級別。 該模塊只能插入模擬連接器（A0，A1 和 A2）。

The Sound Sensor Module can be used to detect the sound strength of the environment. We divide the sound into 5 levels, you can use our block to get the current level. This module can only be plugged into analog connector (A0,A1 and A2).



Module	Connect Type	Available Connectors
Sound Sensor	Analog	A0, A1, A2

Block API

Get sound level

獲取當前聲級，我們將聲音分為 5 級，範圍從 1 到 5.其中 1 表示安靜，5 表示噪聲。

Get current sound level, we divide the sound into 5 levels, range from 1 to 5.which 1 represent quiet and 5 represent noisy.


```
function MICGetLevel(connName: AnalogConnName): number;
```

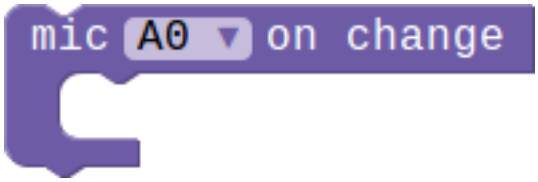
Parameters

- **connName** is the analog connector's name.this module can only be pluged into analog connector A0,A1 and A2.

Sound Sensor event

配置 mcu 定期檢查聲級，然後每當聲級變化時執行相關的代碼塊。

Configure the mcu check the sound level periodically, and then execute the associated code block whenever the sound level change.




```
function onMICEvent(connName: AnalogConnName, body: () => void): void;
```

Parameters

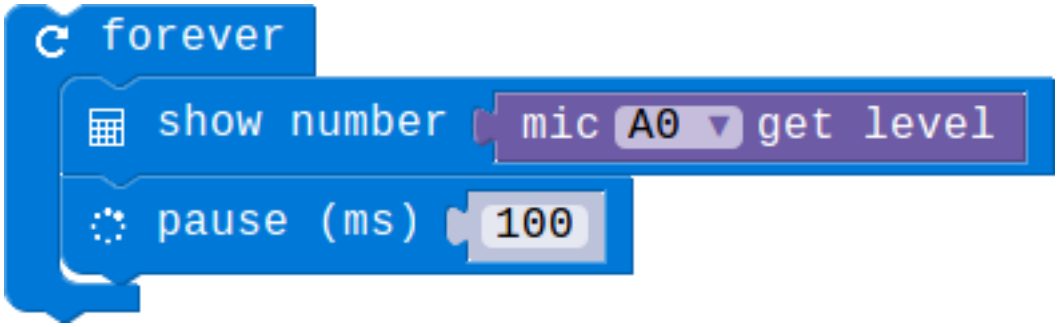
- **connName** is the analog connector's name.this module can only be pluged into analog connector A0,A1 and A2.

Example

Show the sound level

此示例顯示如何獲取當前聲級，並在 LED 屏幕上顯示電平。

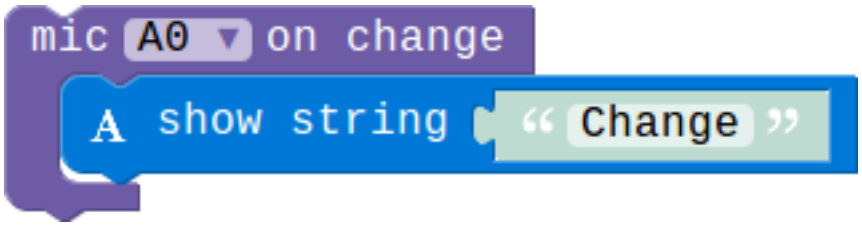
This example show you how to get the current sound level, and show the level number on the LED screen.



Sound level change event

當聲級變化時，字串將顯示在屏幕上

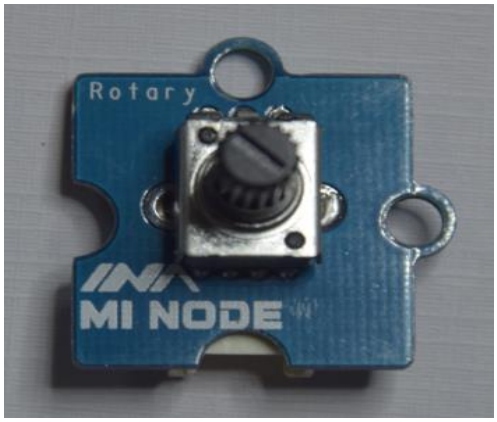
When the sound level changes a string will show on the screen.



Rotary Module

通過調整 0～300 的角度範圍，Rotary 可以在 0 和 Vcc 之間產生類比輸出。該模塊只能插入類比連接器（A0，A1 和 A2）。

The Rotary can produce analog output between 0 and Vcc by adjust the angular range from 0 ~ 300.This module can only be plugged into analog connector(A0,A1 and A2).



Module	Connect Type	Available Connectors
Rotary Sensor	Analog	A0, A1, A2

Block API

Get the percentage

獲取當前的旋轉百分比。 該值表示旋轉模塊旋轉了多少。

Get the current rotary percentage. This value means how much you have rotated the rotary module.


```
function RotaryGetPercentage(connName: AnalogConnName): number;
```

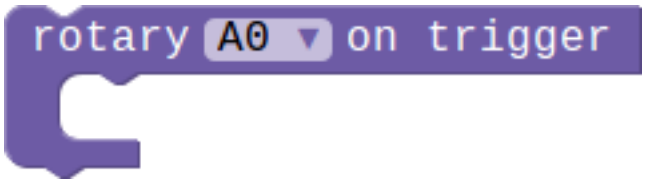
Parameters

- **connName** is the analog connector's name. this module can only be pluged into analog connector A0,A1 and A2.

Light Sensor event

配置 mcu 定期檢查旋轉 AD 值，然後每當 AD 值更改時執行相關的代碼塊。

Configure the mcu check the rotary AD value periodically, and then execute the associated code block whenever the AD value changes.




```
function onRotaryEvent(connName: AnalogConnName, body: () => void): voi
d;
```

Parameters

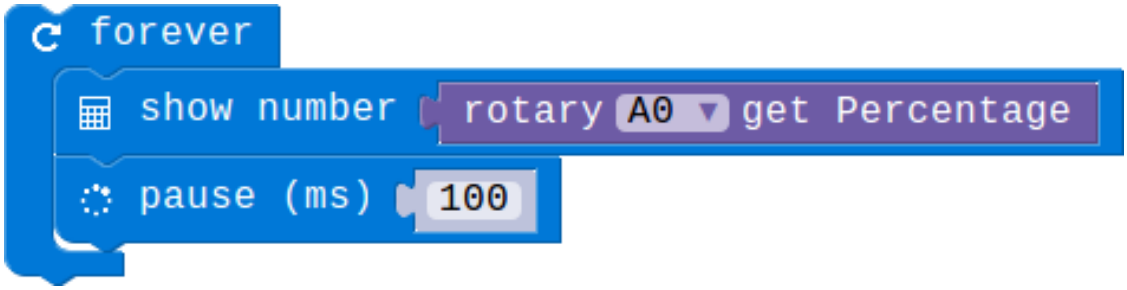
- **connName** is the analog connector's name.this module can only be pluged into analog connector A0,A1 and A2.

Example

Show the percentage

此示例顯示如何獲取當前百分比，並將其顯示在 LED 屏幕上。

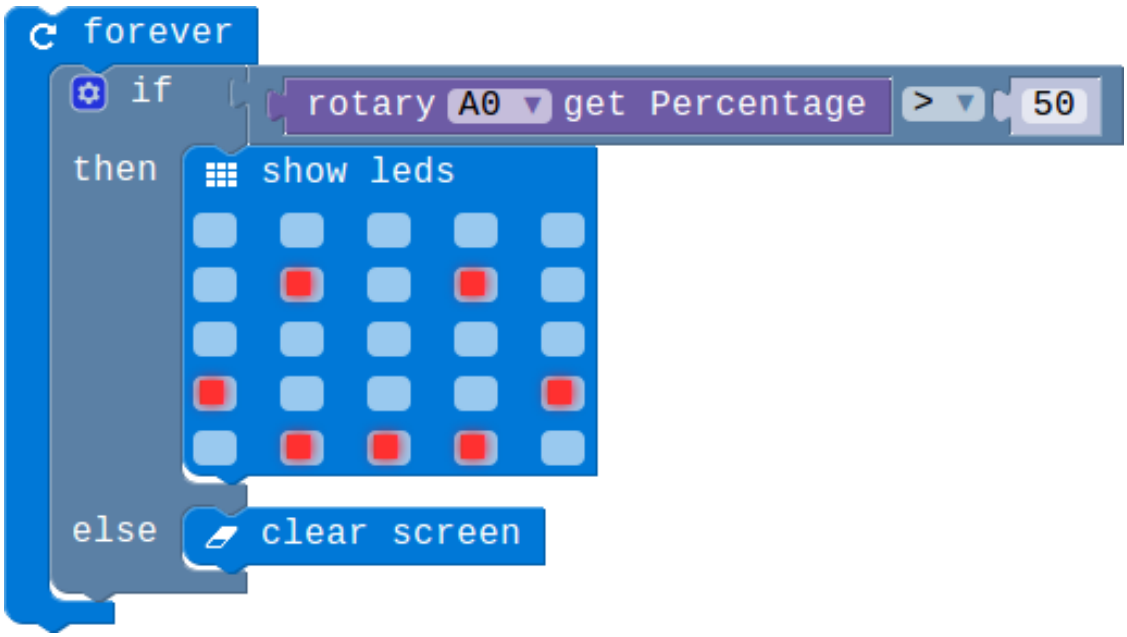
This example show you how to get the current percentage ,and show it on the LED screen.



Rotary control the LED show

當百分比小於 50 時，屏幕將不會顯示，否則屏幕上會顯示一個笑臉。

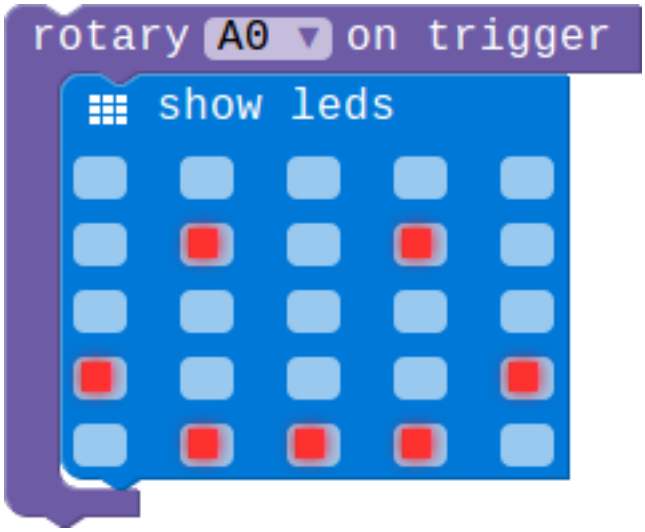
When the percentage is smaller than 50 the screen will show nothing,otherwise there will be a smile face on the screen.



Rotary change event

旋轉電位器旋鈕時，液晶顯示屏將顯示笑臉。

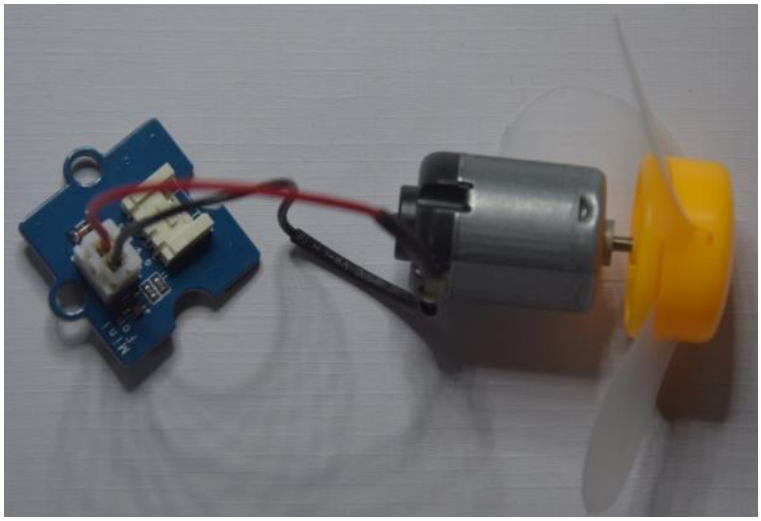
When you rotating the potentiometer's knob ,the LED screen will show a smile face.



Mini Fan Module

迷你風扇模塊包含直流電機和軌道風扇，可根據不同情況控制電機的轉速。

The mini fan module contains a DC motor and orbit fan. we can control the speed of the motor according to different situations.



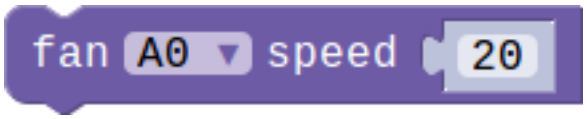
Module	Connect Type	Available Connectors
Mini Fan Module	Analog	A0, A1, A2

Block API

Control the motor speed

我們使用此塊來控制電機的速度。您可以通過調整第二個參數來改變速度，範圍從 0 到 100。

We use this block to control the motor's speed. you can change the speed by adjustmenting the second parameter, range from 0 to 100.




```
function FanControl_1(connName:AnalogConnName , speed:number): void
```

Parameters

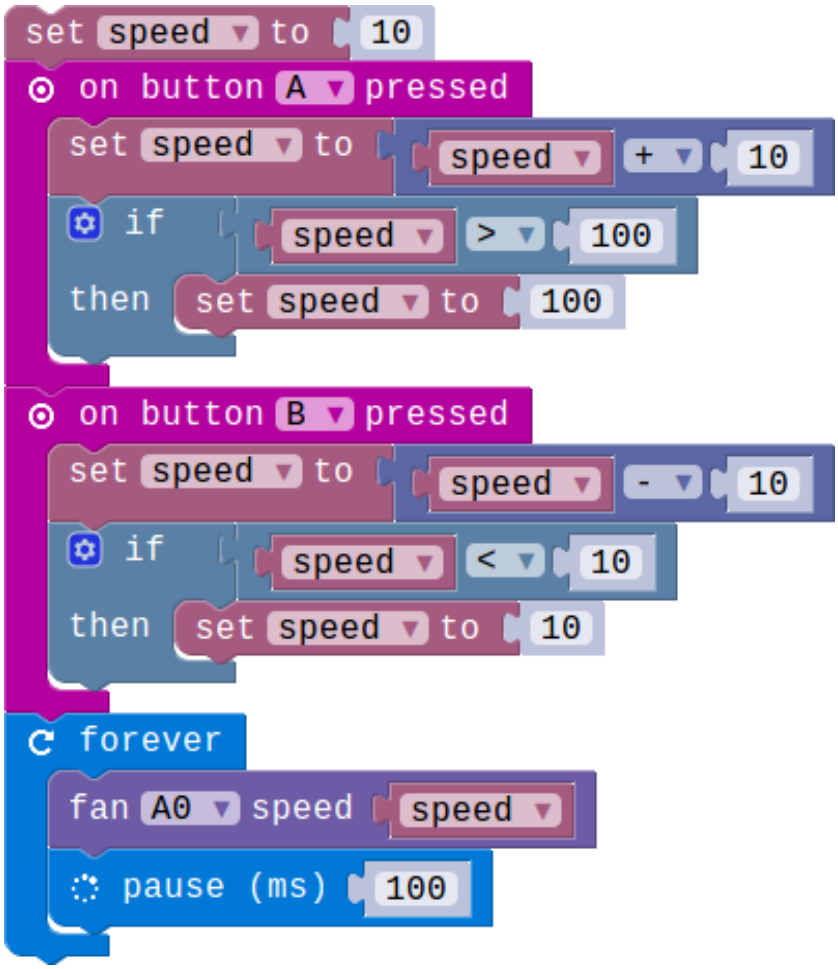
- **connName** is the analog connector's name.this module can only be pluged into analog connector and digital connector.
- **speed** is the speed of the motor.The adjustment range is from 0 to 100.which 0 means the motor is shuting down and 100 means the fastest speed.

Example

Use button to control the motor's speed.

本示例說明如何使用按鈕 A 和 B 控制電機轉速。 按鈕 A 控制電機加速，按鈕 B 控制電機減速。

This example show you how to use the button A and B control the motor speed . Button A control the motor to speed up, button B control the motor to deceleration.



Speaker Module

揚聲器可用於通過使用音樂塊發出聲音

The Speaker can be used to make a sound by using the Music blocks.

NOTE

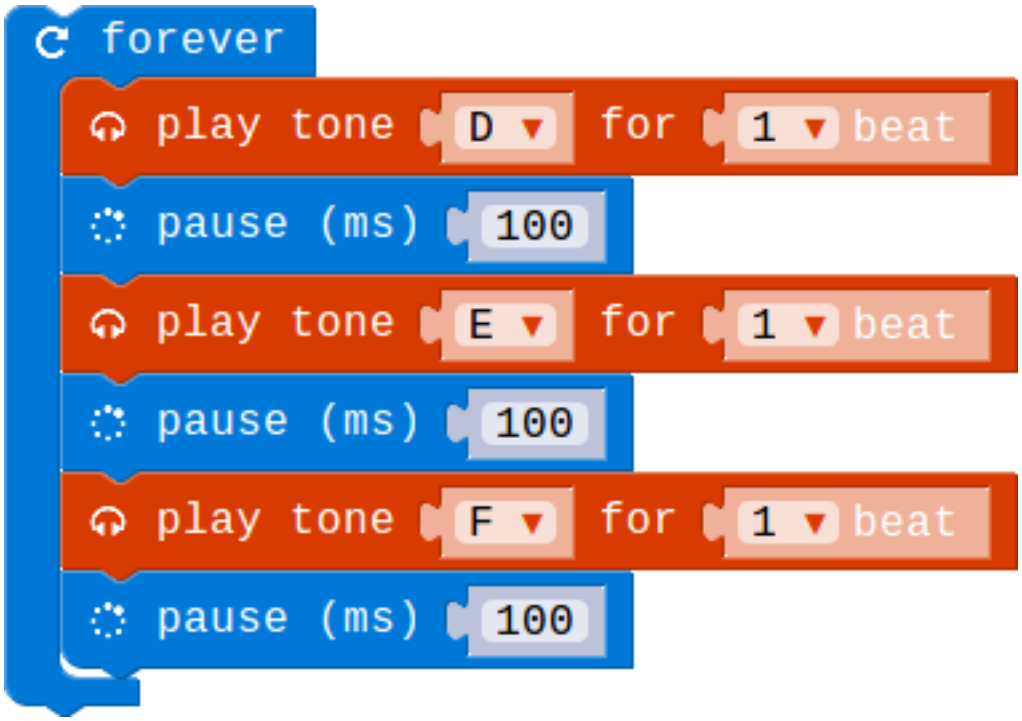
As the default music is speaking through **pin P0**,so we need to connect our speaker module to **connector A0**.

Module	Connect Type	Available Connectors
Speaker Module	Analog	A0

Example

Let your speaker make a sound

The speaker will circle the sound of the three beat.



PIR Module

PIR 運動傳感器允許用戶感測運動，通常在其範圍內的人體運動。 當該模塊檢測到有物體移動時，PIR 信號線將從低電平跳到高電平，並保持高電平 3 秒。

The PIR Motion Sensors allows user to sense motion, usually human movement in its range. When this module detects that there is an object moving, the PIR signal line will jump from the low level to the high level, and keep the high level for 3 seconds.

Module	Connect Type	Available Connectors
PIR Module	Digital IO	D12, D13, D14, D15

Block API

Check the PIR status

檢查開關是否被觸發。當 pir 模塊被觸發時，檢測到的狀態信號將處於高電平。

Check whether the switch is triggered or not.when the pir module is triggered the status signal which was detected will be in high level.


```
function PIRIsTriggered(connName: ConnName): boolean;
```

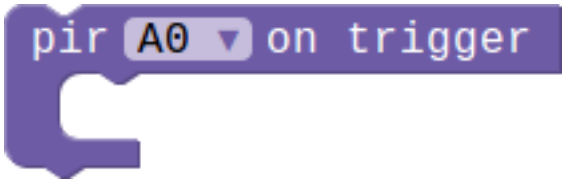
Parameters

- **connName** is the connector's name.this module can be pluged into both analog connector and digital connector.

PIR event

配置指定的數字輸入引腳，然後每當上升沿引腳指示 PIR 檢測到移動時，執行相關的代碼塊。

Configure the specified pin for digital input, and then execute the associated code block whenever the pin in rising edge which means the PIR has detected movement.




```
function onPIREvent(connName: ConnName, body: () => void): void;
```

Parameters

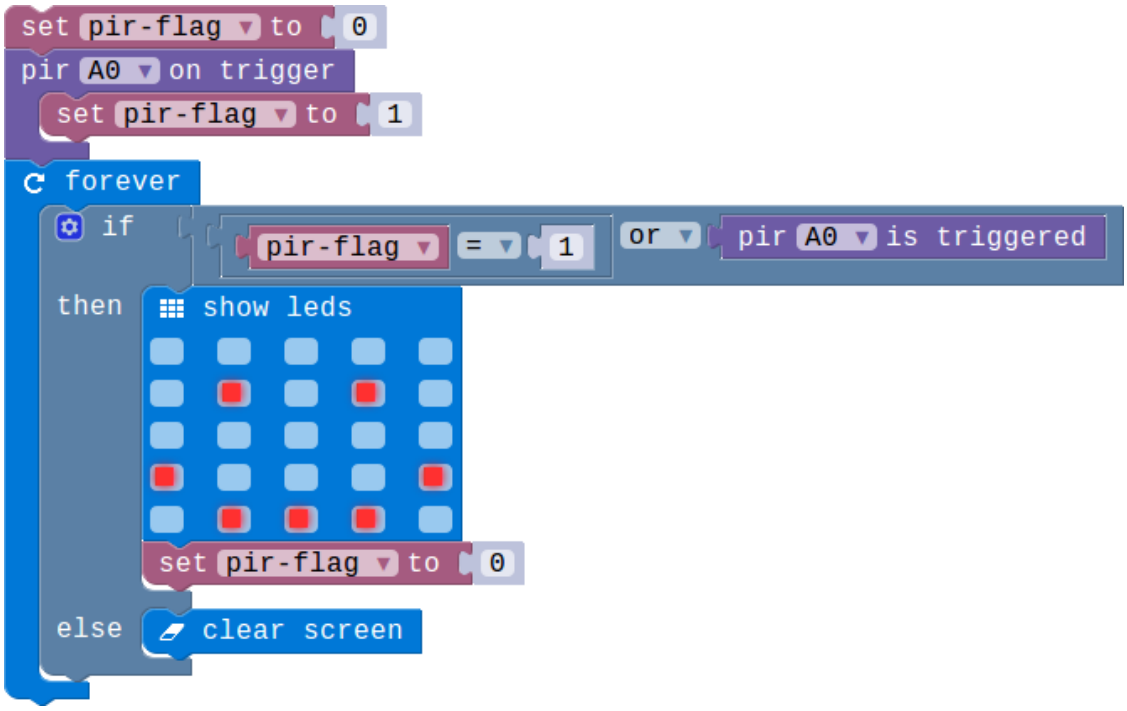
- **connName** is the connector's name.this module can be pluged into both analog connector and digital connector.

Example

Detecting the movement

當 PIR 檢測到移動的物體時，屏幕將顯示一個笑臉，當沒有移動的東西在它的範圍內時，屏幕將不會顯示。

When the PIR detected the moving objects,the screen will show a smile face.when there are no moving things in it range the screen will show nothing.



RGB LED

彩色 LED。 顏色和亮度可以編程。 顏色和亮度由紅色，綠色和藍色的灰度值控制。

A colorful LED. The color and brightness can be programable. And the color and brightness is controled by the gray value of red, green and blue.

Module	Connect Type	Available Connectors
RGB LED	Digital IO	D12, D13, D14, D15

TODO [HW Team] Need hardware engineers to add this module's specific parameters.

Block API

Choose a RGB color

You can choose a given color to show.


```
function RGBChooseColor(connName: ConnName, color: MiNodeColor): void;
```

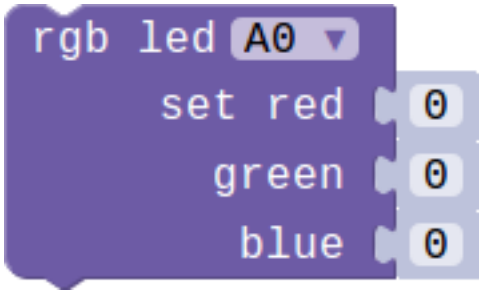
Parameters

- **connName** is the analog connector's name.this module can be pluged into both analog connector and digital connector.
- **color** is set of colors.That is red,green,blue,yellow,pink,cyan and white.you can choose one color from the given color to light up you RGB module.

Set a specific RGB color by setting rgb gray value

您可以通過設置三個灰度值來更改 RGB 的顏色。

You can change the color of the RGB by setting the three gray values.




```
function RGBSetColor(connName: ConnName, red: number, green: number, bl
ue: number): void;
```

Parameters

- **connName** is the analog connector's name.this module can be pluged into both analog connector and digital connector.
- **red** is the gray value of red,range from 0 to 255.
- **green** is the gray value of green,range from 0 to 255.

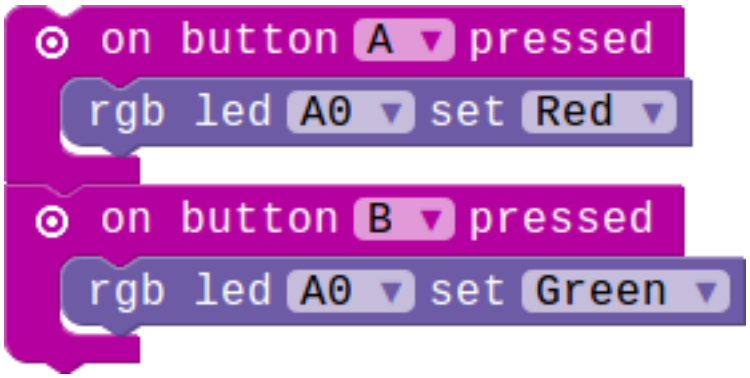
- **blue** is the gray value of blue,range from 0 to 255.

Example

Use button to show different color.

當您按下按鈕 A 時，RGB 模塊將顯示紅色，如果按按鈕 B，顏色將變為綠色。

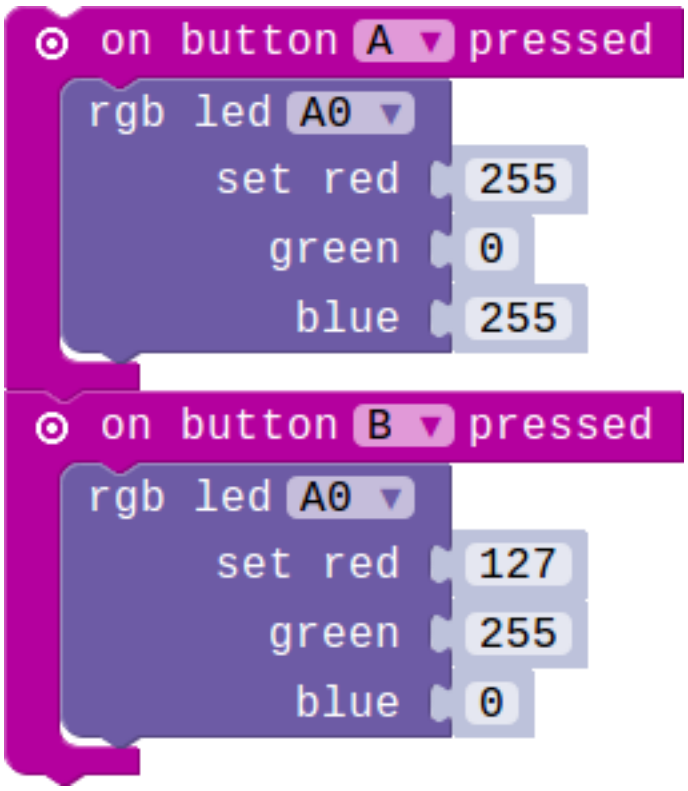
When you press button A the RGB module will show red,if you press button B the color will be green.



Set specific color

此示例顯示如何設置特定顏色。 按鈕 A 和 B 有兩種不同的顏色控制，按兩個按鈕可以得到相應的顏色。

This example show you how to set a specific color. There are two different color controlled by button A and B. press the two button you will get the corresponding color.



Switch Module

The switch module can used to switch ON/OFF.

Module	Connect Type	Available Connectors
Switch Module	Digital IO	D12, D13, D14, D15

TODO [HW Team] Need hardware engineers to add this module's specific parameters.

Block API

Check the switch's status

Check whether the switch is openeded or not.


```
function switchIsOpened(connName: ConnName): boolean;
```

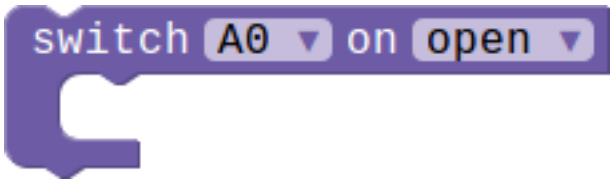
Parameters

- **connName** is the connector's name.this module can be pluged into both analog connector and digital connector.

Switch event

配置指定的數字輸入引腳，然後在開關打開或關閉時執行相關的代碼塊。

Configure the specified pin for digital input, and then execute the associated code block whenever the switch is opened or closed.




```
function onSwitchEvent(connName: ConnName, event: SwitchEvent, body: ()
 => void): void;
```

Parameters

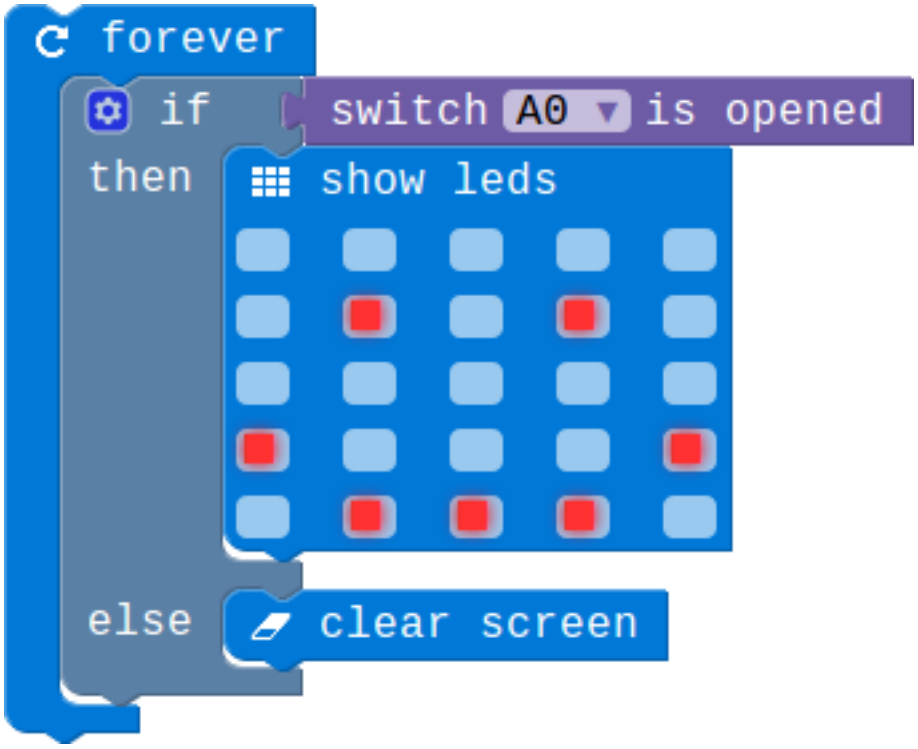
- **connName** is the analog connector's name.this module can be pluged into both analog connector and digital connector.
- **event** represent two status of switch,open and close.

Example

Switch control the screen show

如果開關打開，屏幕將顯示一個笑臉，否則將不顯示任何內容

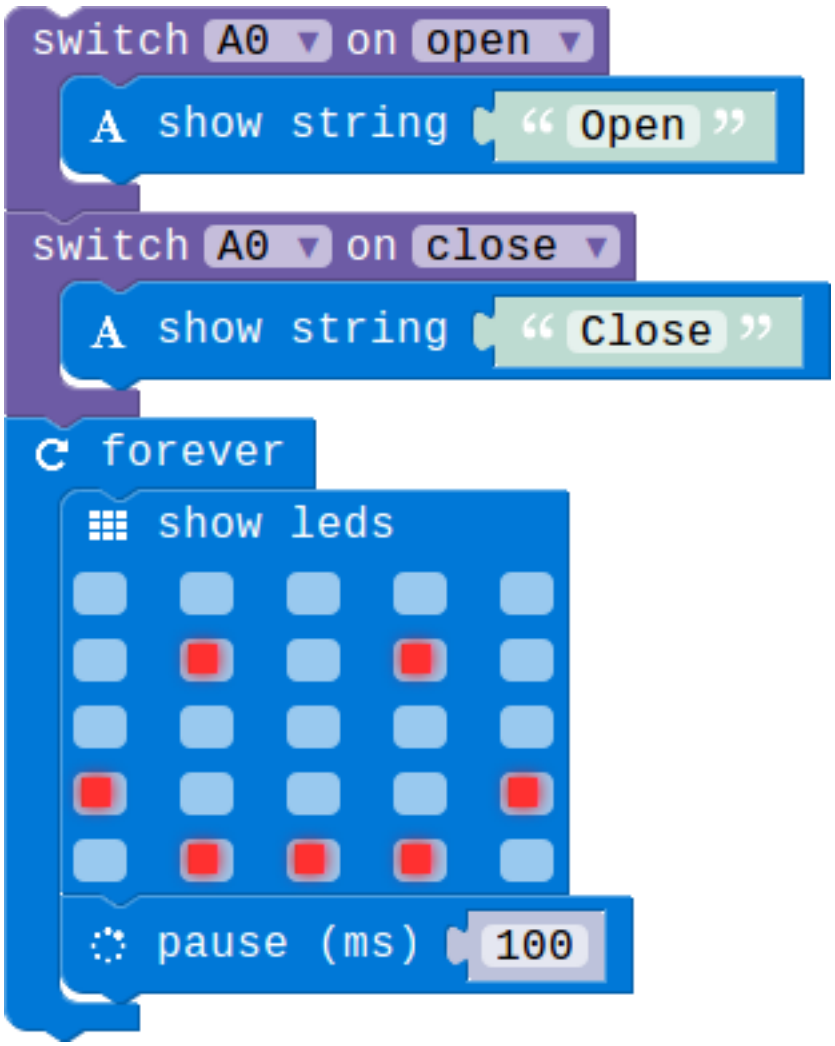
If the switch is opened the screen will show a smile face , otherwise it will show nothing.



Show the switch module's status

在這個例子中，我們使用 switch 事件來顯示交換機的狀態。 當開關打開時，LED 屏幕將顯示一個字符串“打開”， 否則 LED 屏幕將顯示“關閉”。

In this example we use the switch event to show the switch's status. When the switch is opened, the led screen will show a string 'Open', otherwise the led screen will show 'Close'.



Relay Module

繼電器是電動開關。 它是一種数字開關，可用於控制高電壓電器，如某些家電。（最大 250V）

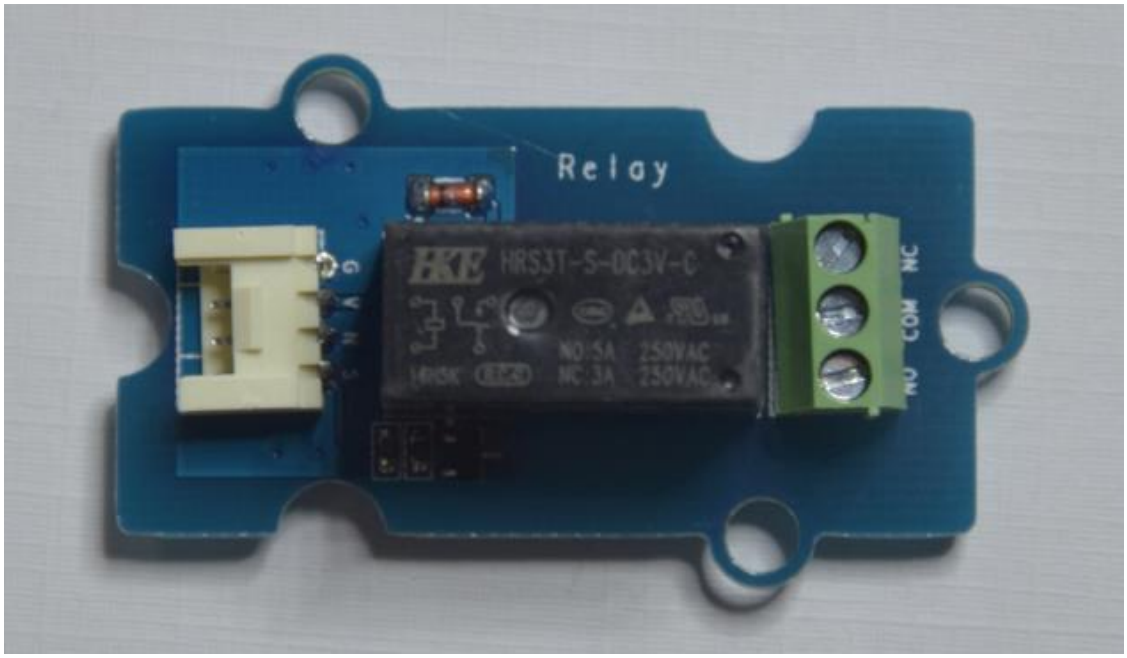
The relay is an electrically operated switch. It is an digital switch can be used to control high-votage electrical devices, such as some home appliances. (maximum 250V)

危險

孩子將繼電器模塊連接到 AC（110V / 220V）設備是很危險的。 我們的這個模塊的目的只是展示如何控製家用電器。 當您打開/關閉繼電器時，您可以聽到一些聲音。 您不必連接到真實設備。

Danger

It's dangerous for kid to attach the relay module to a AC(110V/220V) device. Our purpose for this module is just showing how to control home appliances. You can hear some sound when you switch the relay **ON/OFF**. You do not have to connect to a real appliance.



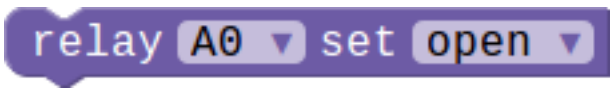
Module	Connect Type	Available Connectors
Relay Module	Digital IO	D12, D13, D14, D15

TODO [HW Team] Need hardware engineers to add this module's specific parameters.

Block API

Set relay status(open/close)

Set the relay module's status open/close.




```
function RelayControl(connName:ConnName , status:FanStatus): void
```

Parameters

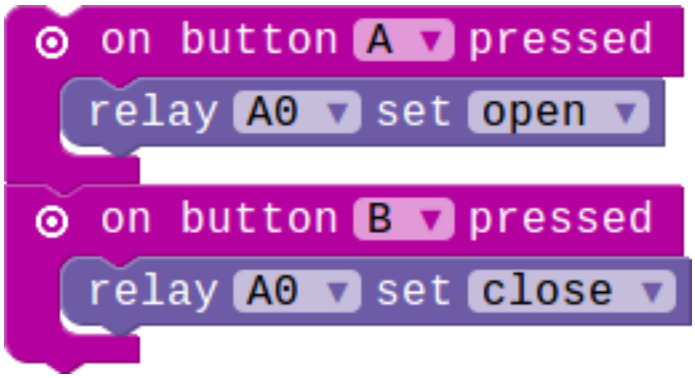
- **connName** is the connector's name.this module can be pluged into both analog connector and digital connector.
- **status** is the status of the relay open or close.

Example

Control the relay by button

按鈕 A 和 B 控制繼電器模塊的打開和關閉。

Button A and B control the open and close of the relay module.



Appendix

Microsoft PXT

- Home: https://pxt.microbit.org/
- Getting Started: https://pxt.microbit.org/getting-started
- Reference Manual: https://pxt.microbit.org/reference/

Support

- Email: support@embest-tech.com

- Website: http://minode.embest-tech.com
- Github repo: http://github.com/minodekit