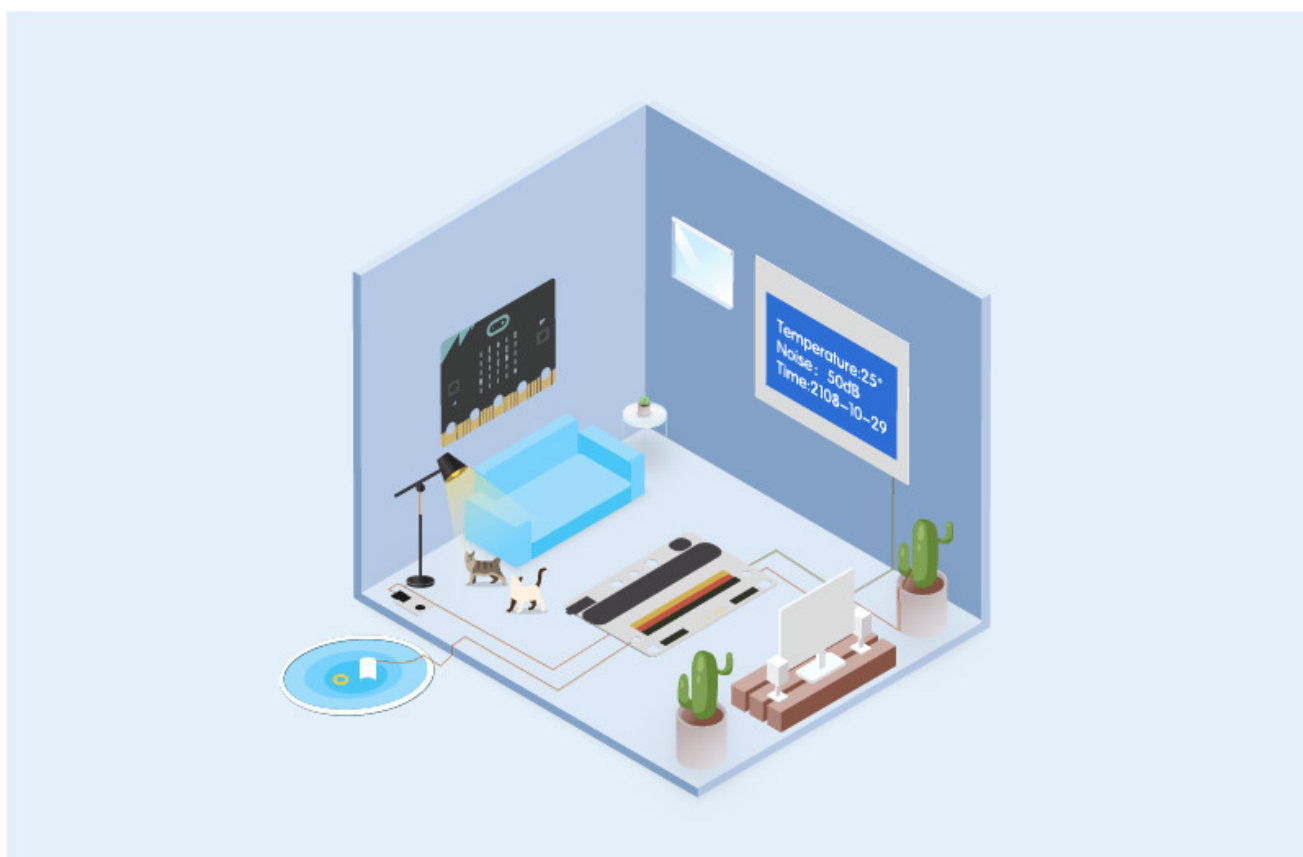


# 1. Introduction

---

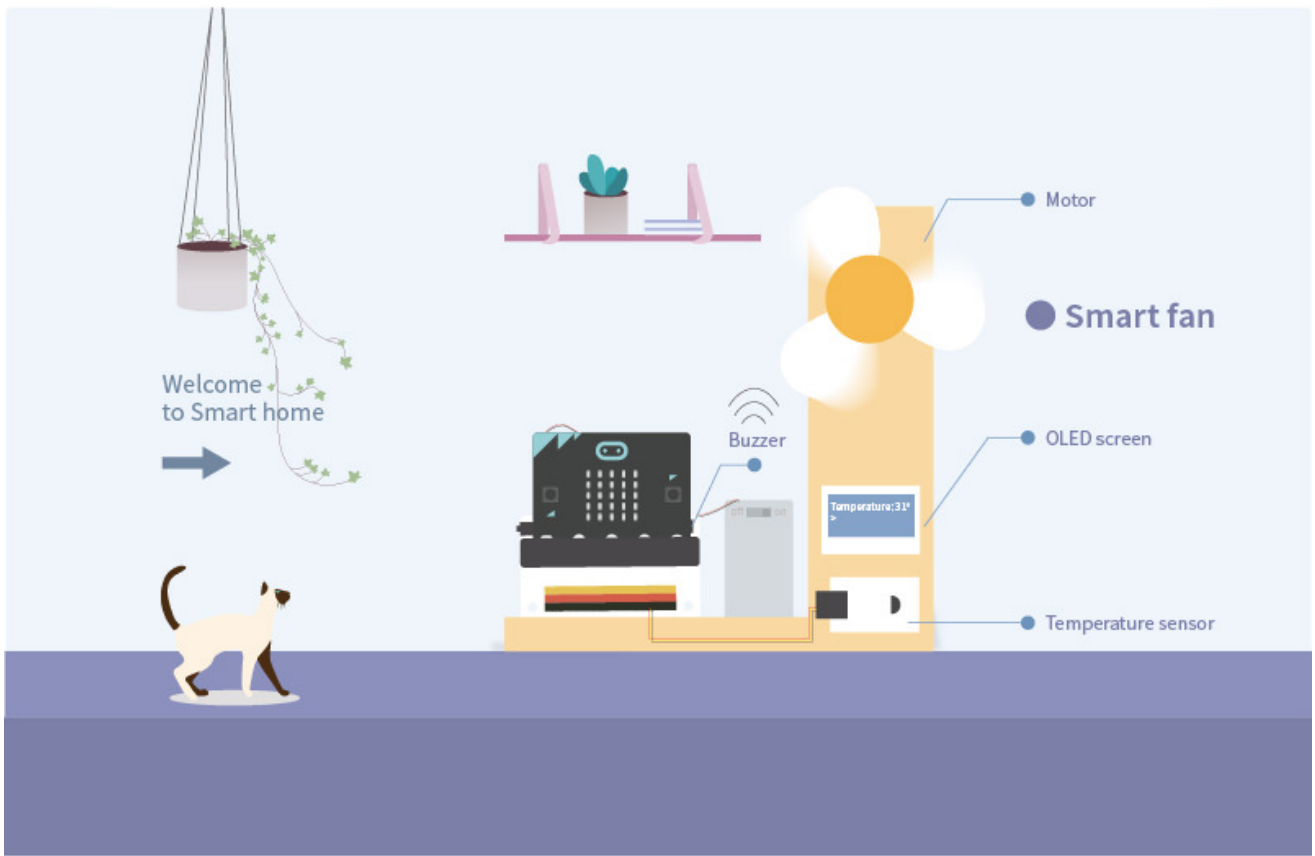
Smart home Kit is a product about smart home project based on micro:bit which is developed by ELECFREAK. We selected executed components commonly used at home as TMP36 temperature sensor, sound sensor, crash sensor, servo, motor. You can build scene like windowsill, wardrobe and fish tank, create yourself smart sweet home and programming to intelligently driving them using micro:bit. Smart home is what makes life more practical and playing with it is what makes life more interesting.



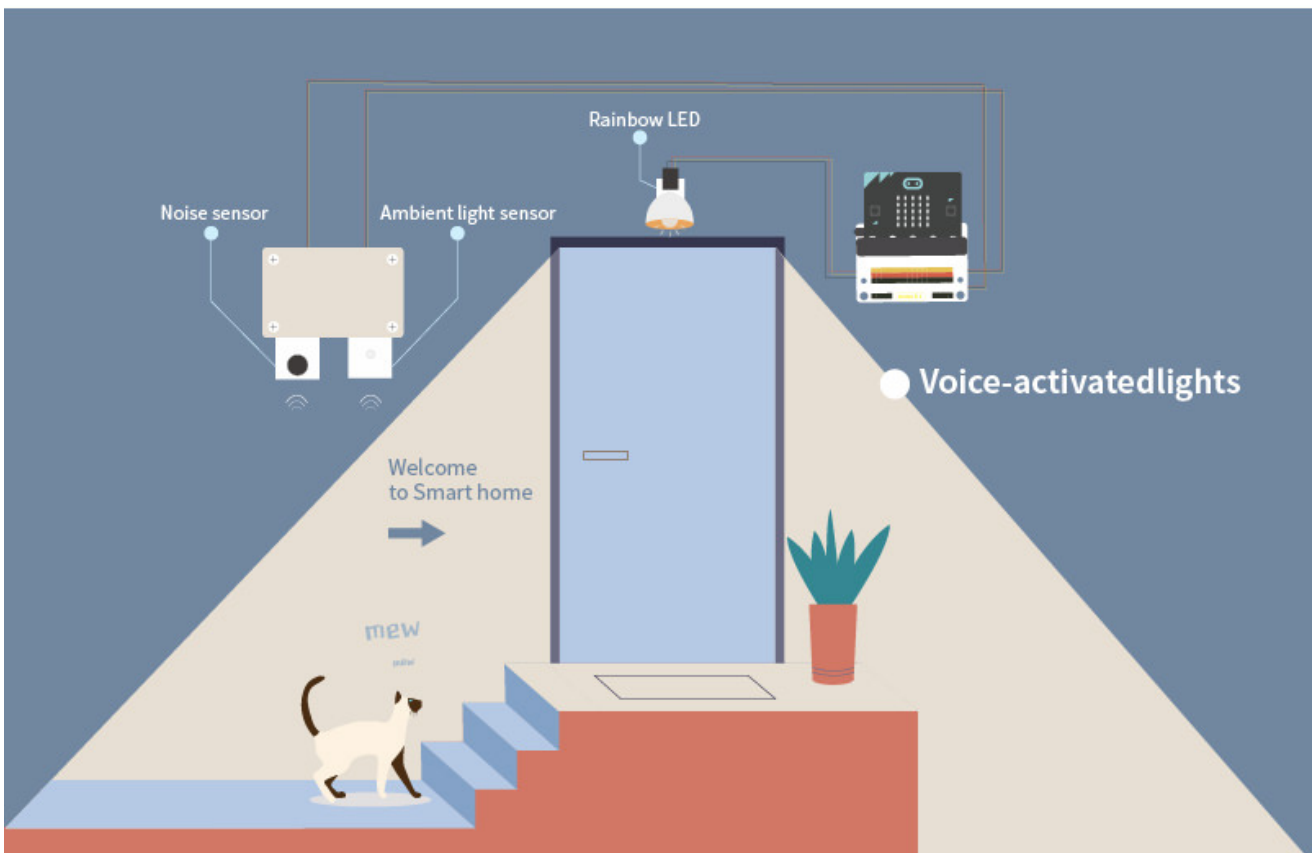
## 1.1. Application Scene

---

### Smart fan



## Voice-activated light



For more practical case, please refer to the materials.

## 1.2. Components

<b>Module</b>	<b>Quantity</b>	<b>Remark</b>
micro:bit	1	Option
3V sensor:bit	1	-
OLED Screen	1	-
Crash E-Blocks	1	-
TMP36 temperature sensor E-Blocks	1	-
Rainbow LED E-Blocks	1	-
Simulation noise sensor E-Blocks	1	-
Light sensor E-Blocks	1	-
Soil moisture sensor E-Blocks	1	-
Relay E-Blocks	1	-
DC motor E-Blocks	1	-
180° servo E-Blocks	1	-
Submersible pump E-Blocks	1	-
Screw driver	1	-
USB Cable	1	-
Crystal Battery Box	1	-
Smart home kit manual book	1	-

## 1.3. FAQ

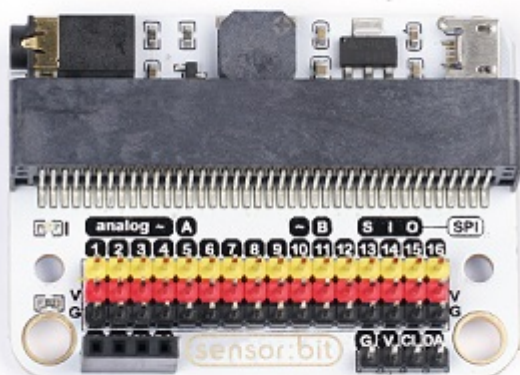
---

## 2. sensor:bit Introduction

### 2.1. Introduction

---

Sensor:bit is a breakout board based on micro:bit. It has extended all available IO ports on micro:bit, and lead out them in the form of GVS. With this board, we can extend various 3V electric brick modules like LED light, photocell, etc.. On the board, it has integrated a buzzer and an audio jack, which allows us to hear music from the buzzer or with our headphone.



### 2.2. Features

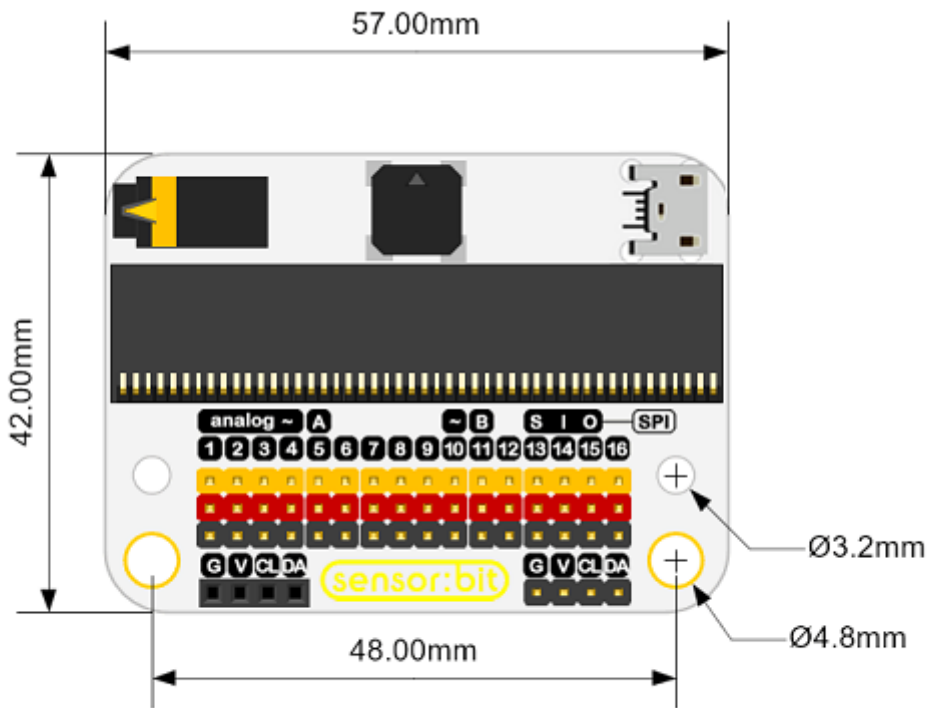
---

- Extend most IO ports by GVS terminal.
- Independently lead out IIC interface. Enable to plug in IIC components like OLED, BME280, etc..
- Integrated a buzzer and an audio jack.
- Support Lego interface.
- Mark out each IO port with silk printing.

### 2.3. Parameters

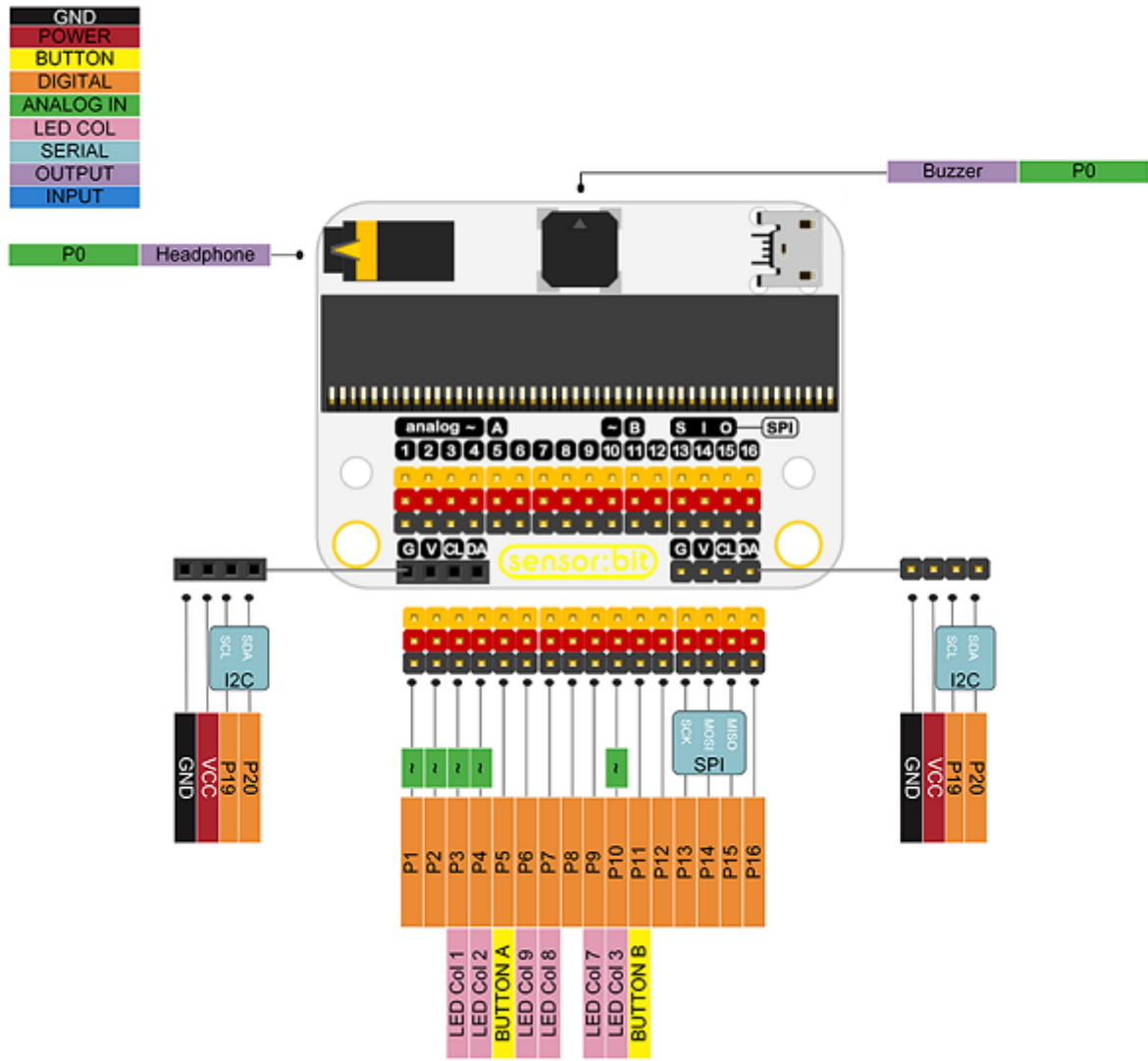
Item	Parameter
Product Name	sensor:bit
Version No.	V1.6
SKU	EF03415
Working Voltage	2.7~3.3V
Buzzer	Support
Lego Interface	Support
Size	57mm x 42mm
Net Weight	18g

## Dimension



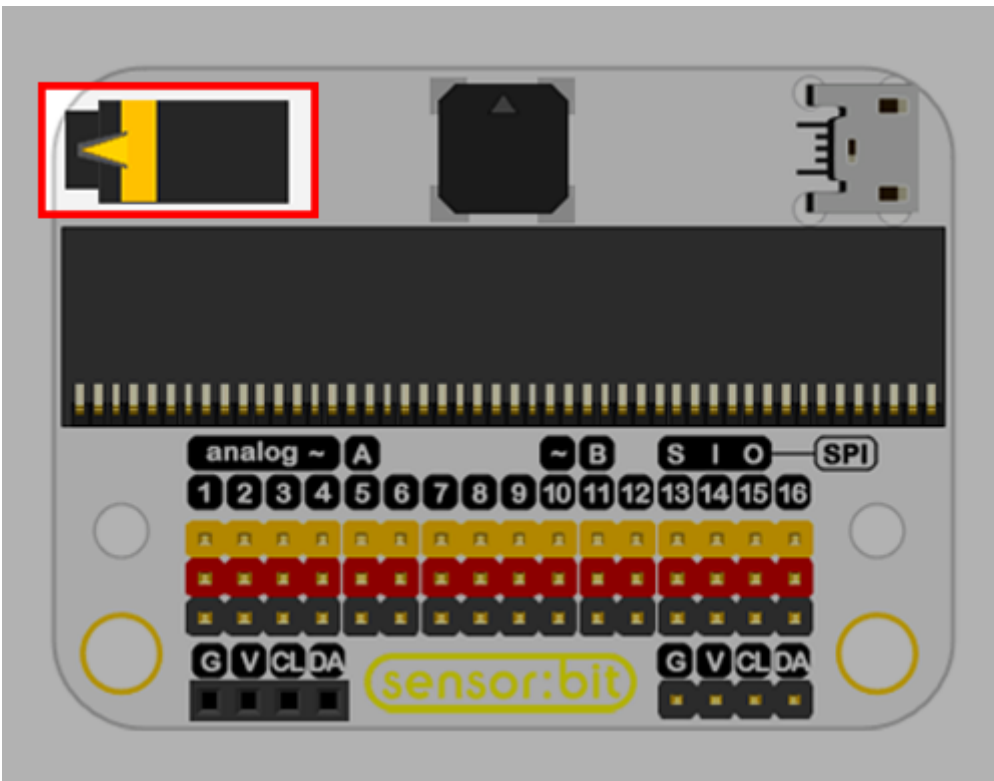
## 2.4. Definition of Pins

# ELECFREAKS SENSOR BIT



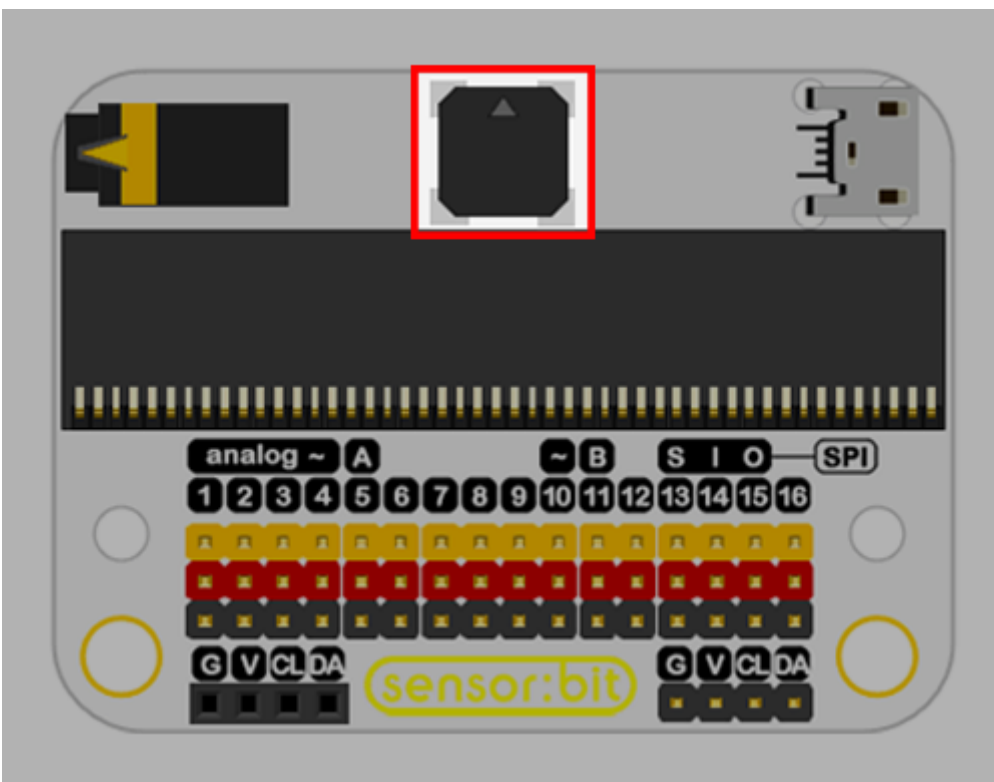
## 2.5. Introduction of Major Components

### Audio Jack



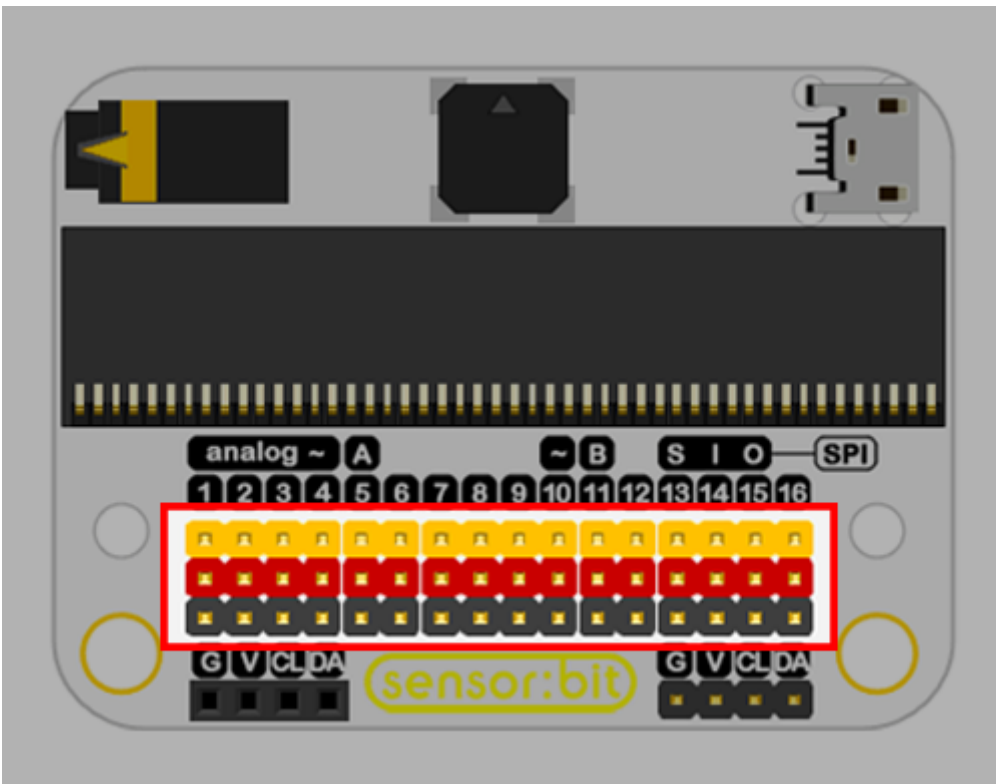
Headphone is controlled by P0 port. Plug in your headphone, the buzzer will disconnect automatically.

## Buzzer



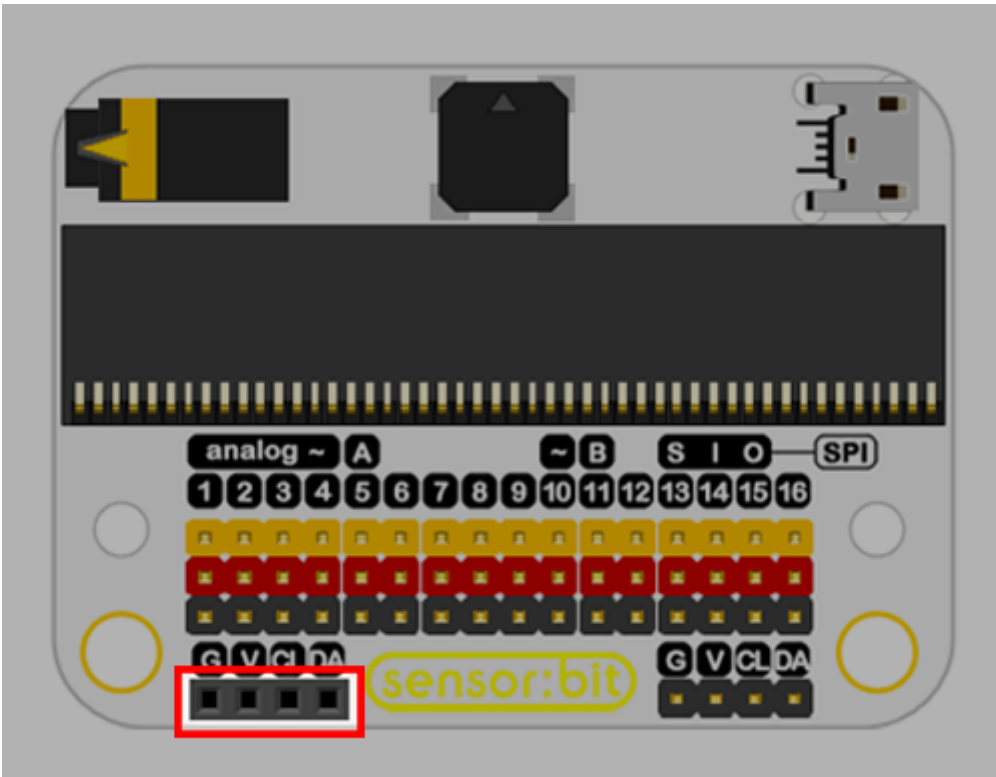
The buzzer is controlled by P0 port. Plug in your headphone, the buzzer will disconnect automatically.

## 16 Channel Standard GVS Port



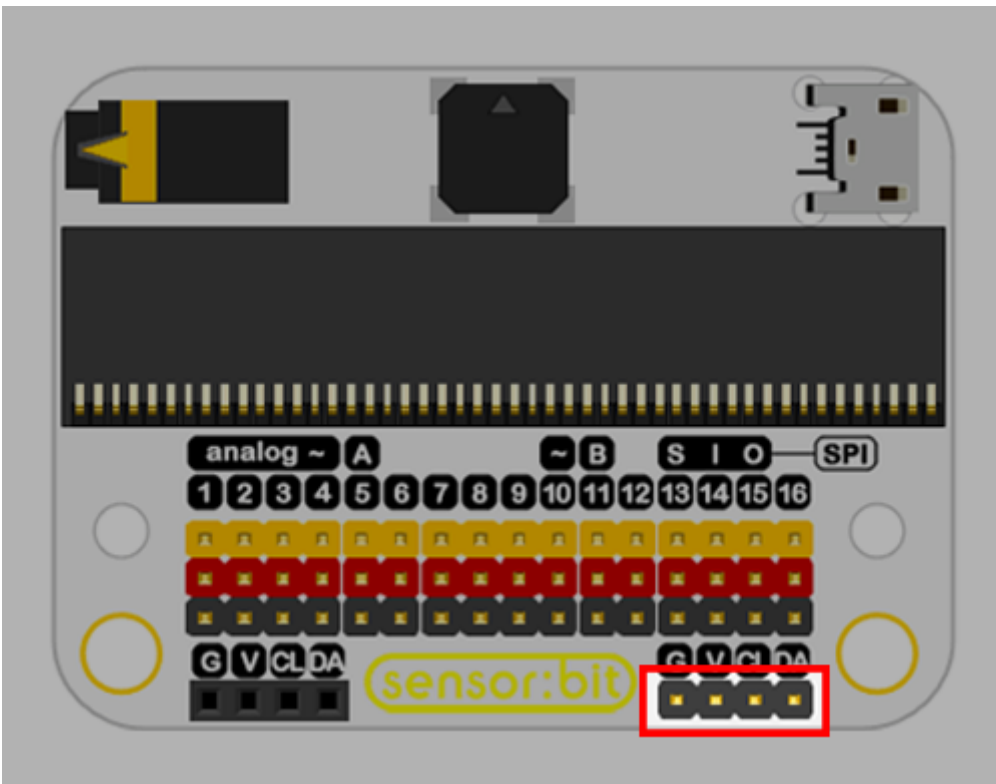
This is a standard GVS interface with 16 channels. It can extend 3V electric brick module.

## I2C Port



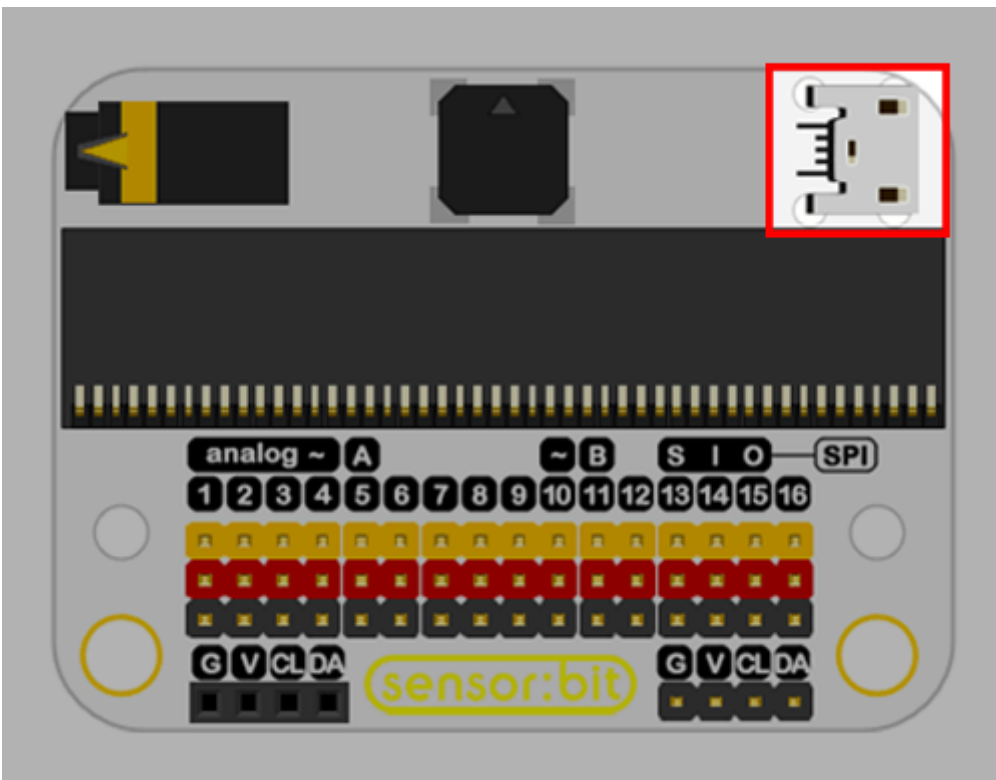
This is a group of I2C female header, which can connect with OLED module directly.





This is a group of I2C male header.

## USB Power Connection

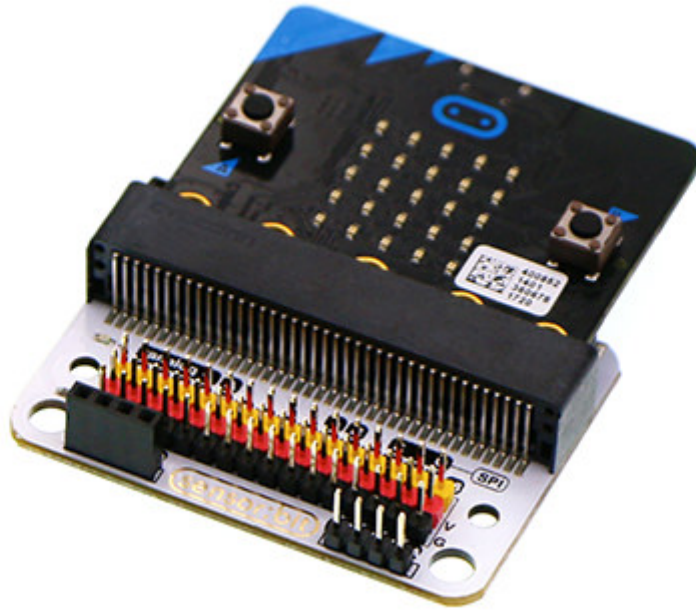


This a USB connection for power-supply.

## 2.6. Quick Start

### Hardware Assembly

Plug your micro:bit into sensor:bit.



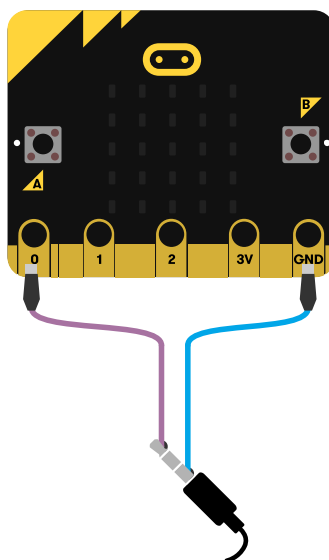
## Software

Navigate to the programming interface of Makecode online editor. Write your code to make the buzzer on sensor:bit play music.

You can see the whole program from the link here:

[https://makecode.microbit.org/\\_3At2iE5Ue3XK](https://makecode.microbit.org/_3At2iE5Ue3XK)

Or you can download it from the page below:



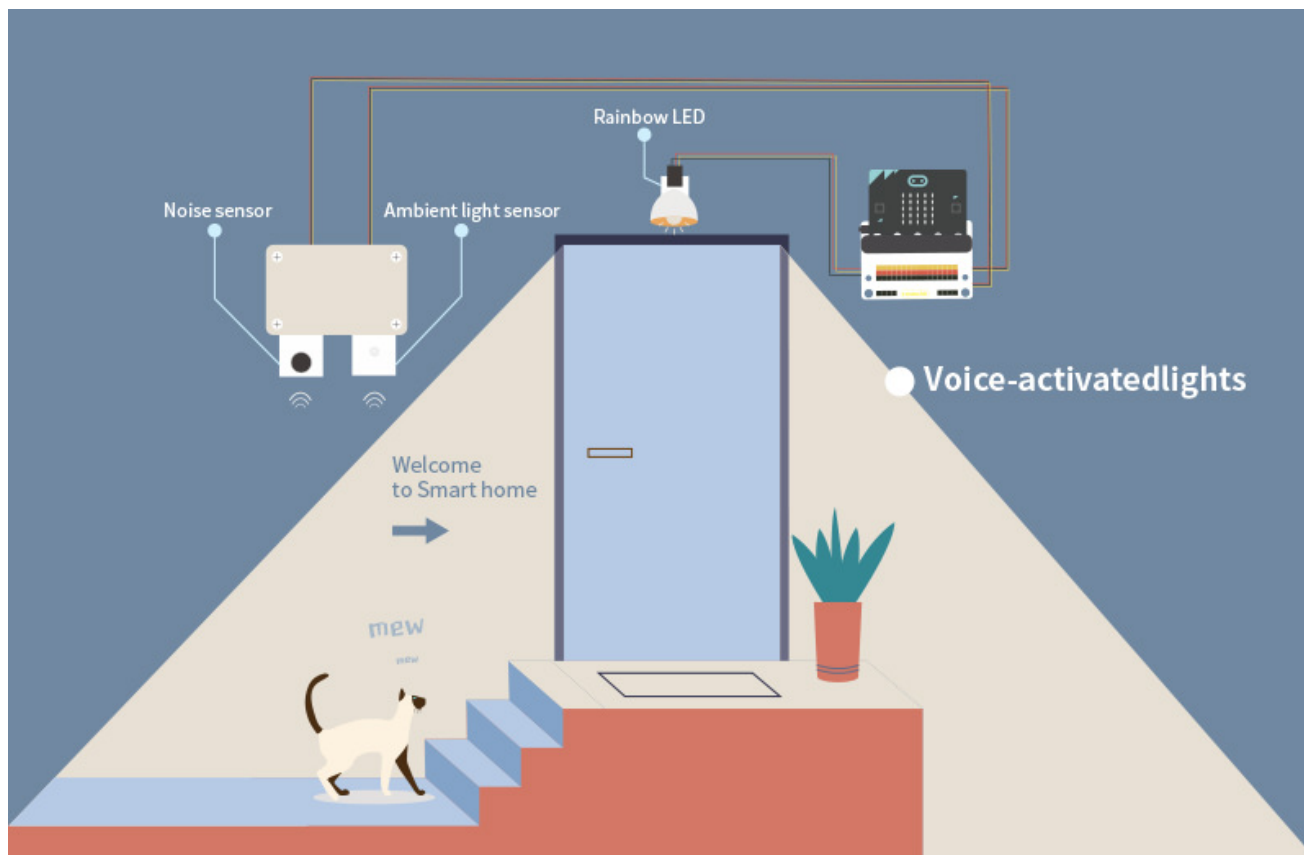
## **Result**

Press button A on micro:bit, the buzzer starts to play music. Plug in your headphone to sensor:bit, the buzzer stops playing music, and you can hear the music with your headphone.

## **2.7. FAQ**

---

## 3. case 01 Voice-activated Lights



### 3.1. Goal

- Make a Rainbow LED controlled by sound and light.

### 3.2. Materials

- 1 x Smart home Kit
- 1 x corrugated board

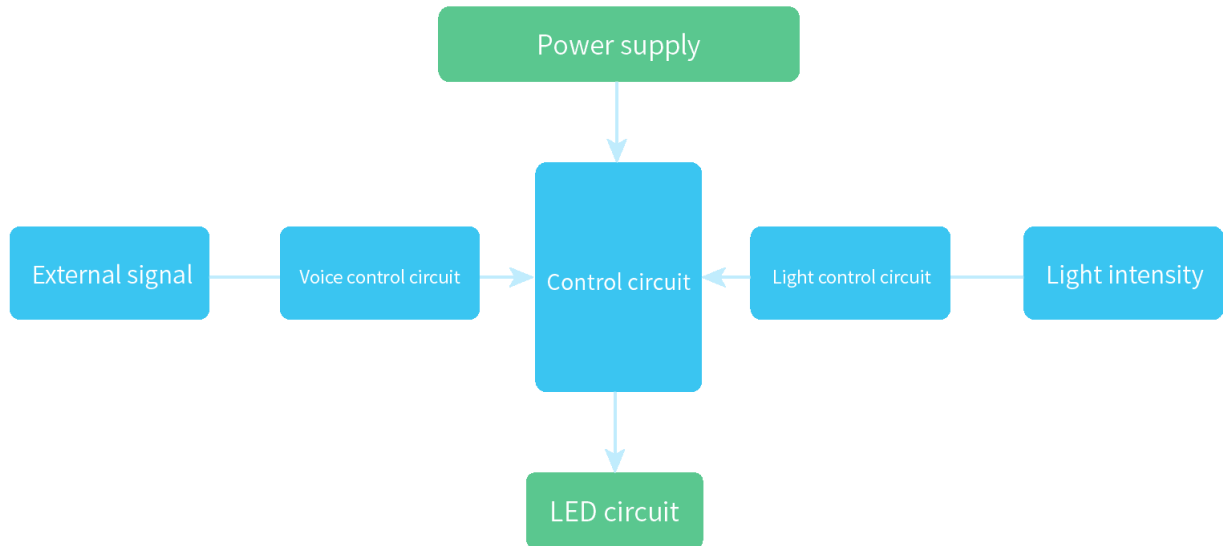
### 3.3. Background

#### What is voice-activated lights

- Voice-activated lights LED voice-activated lights are controlled by voice, light and time delaying with sound sensor and light sensor.

## Explanation

- The LED will not light up even it sensors sound during the day because of the light sensor lock. The light sensor lock will in standby mode while the light gets low in the evening, and the LED will up when it sensor voice. It will automatically off after a time delay. Life of voice-activated lights is six times more than common lights. It helps people avoid trouble about finding switch as well as save electricity.



## 3.4. Practical operation

---

Materials: corrugated board and cutter



Build as below picture:

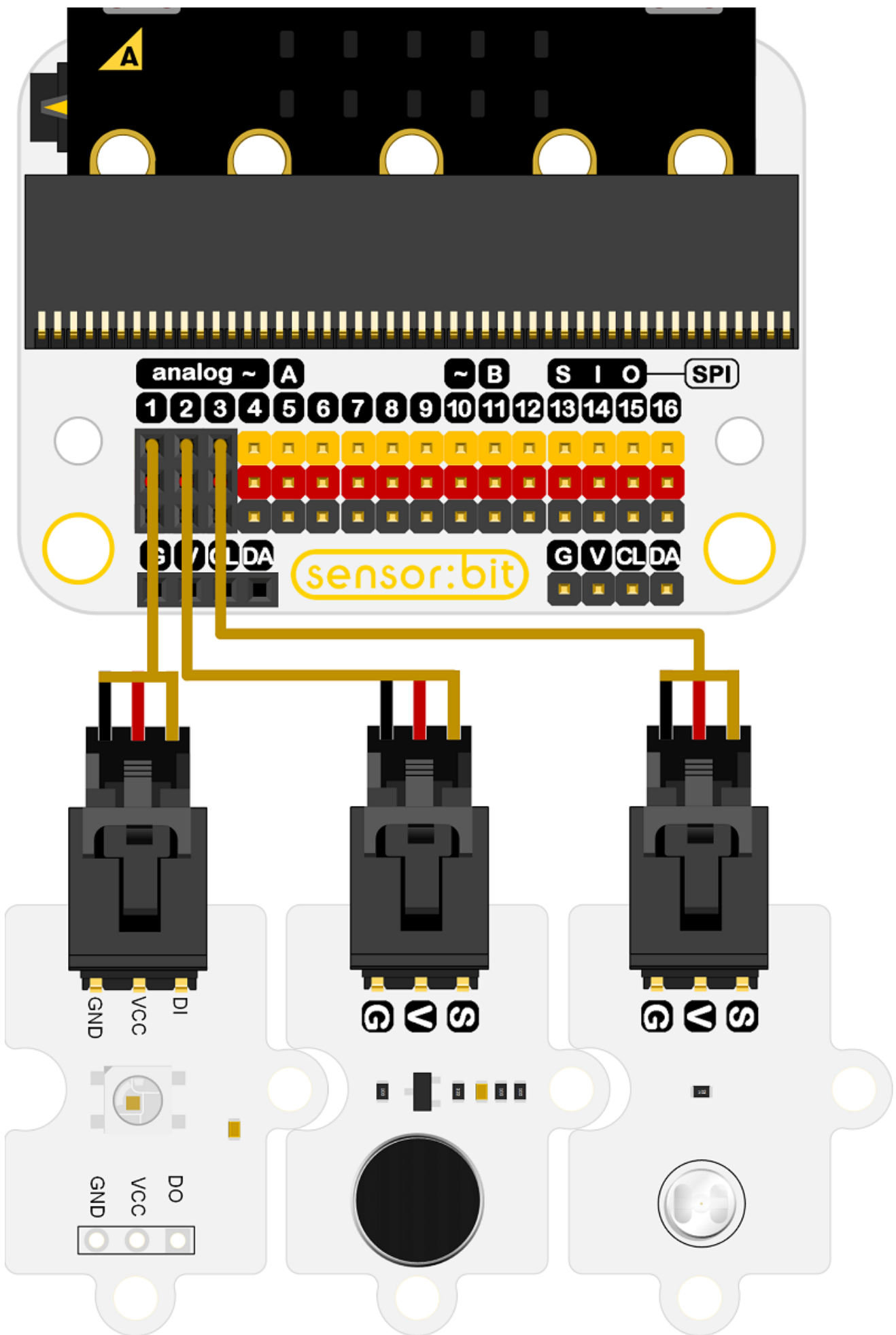


Paste devices as below picture:



### 3.5. Hardware connect

---



Connect one Rainbow LED to P1 of sensorbit.

Connect sound detect device to P2.



Connect light sensor to P3.

## 3.6. Software

---

makecode

Edge Connector Data Sheet

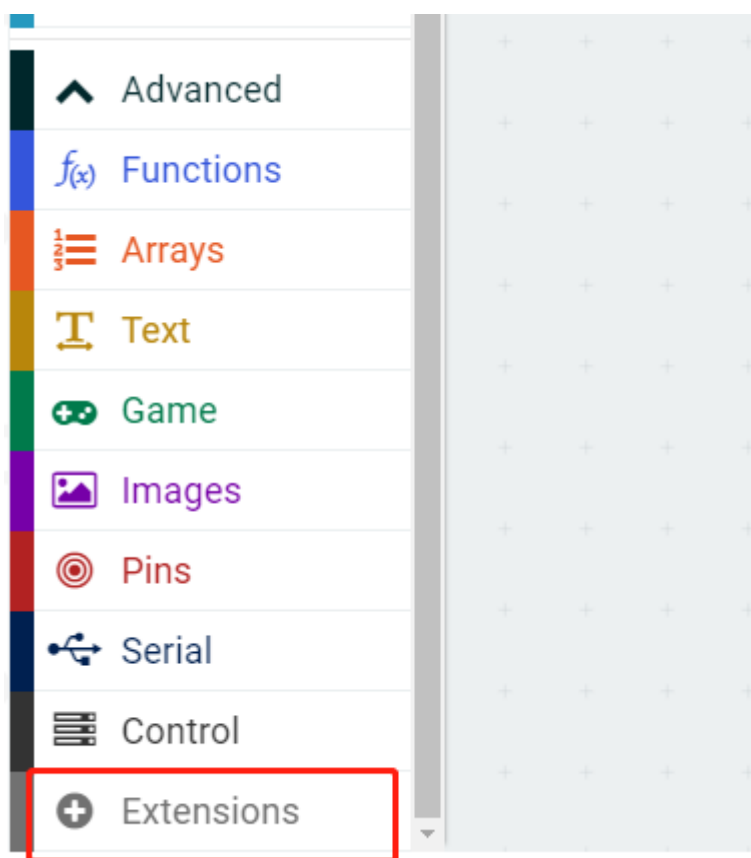
We will use P3, but firstly we need disable the LED Array because it also use P3.

## 3.7. Programming

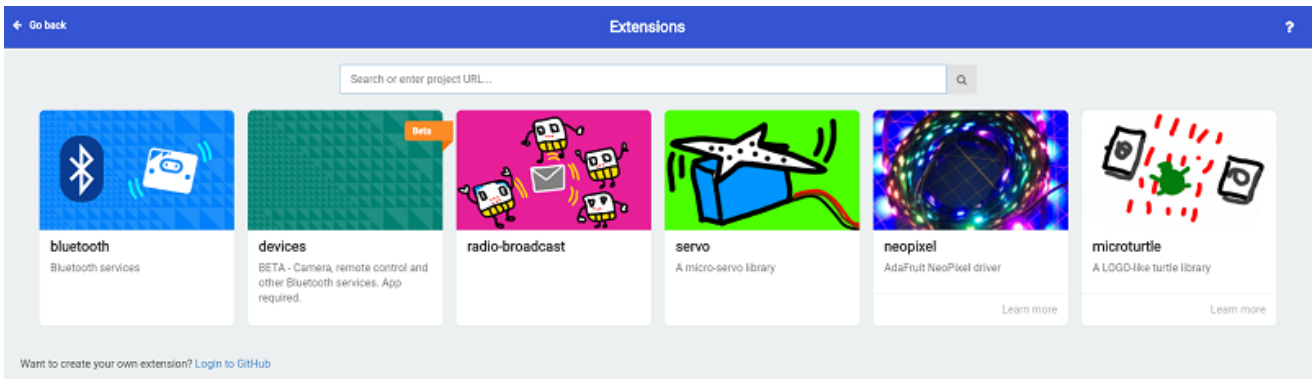
---

### Step 1

Go to MakeCode page, click Advanced in the code block and click on Extensions.



We need to add a new codebase for programming of smart home. Finding “Add Package” in the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.

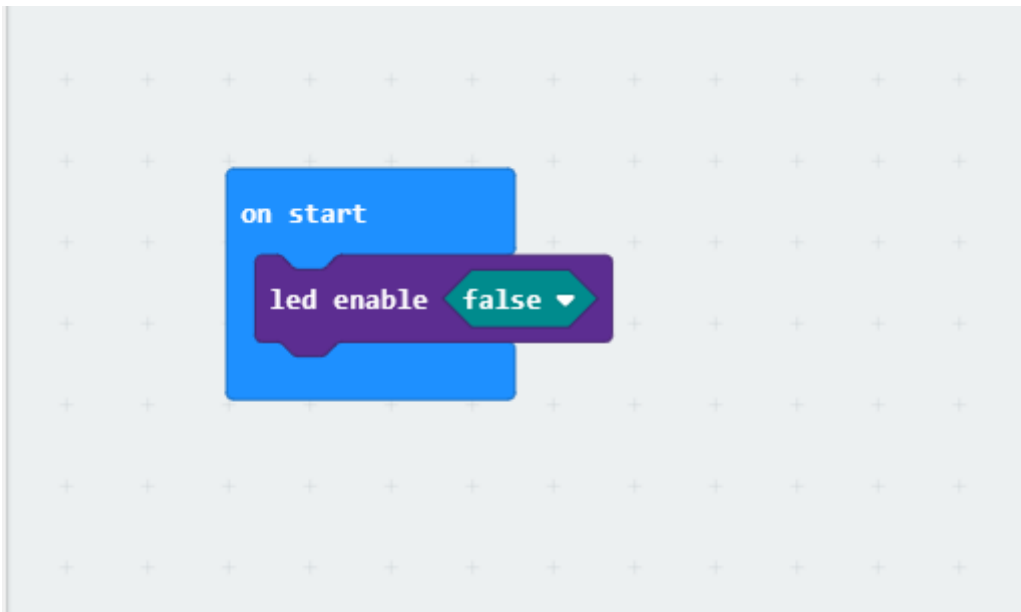


Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in item menu bar.

## Step 2

Drag forever block from Basic, drag show number block and it snaps into forever.

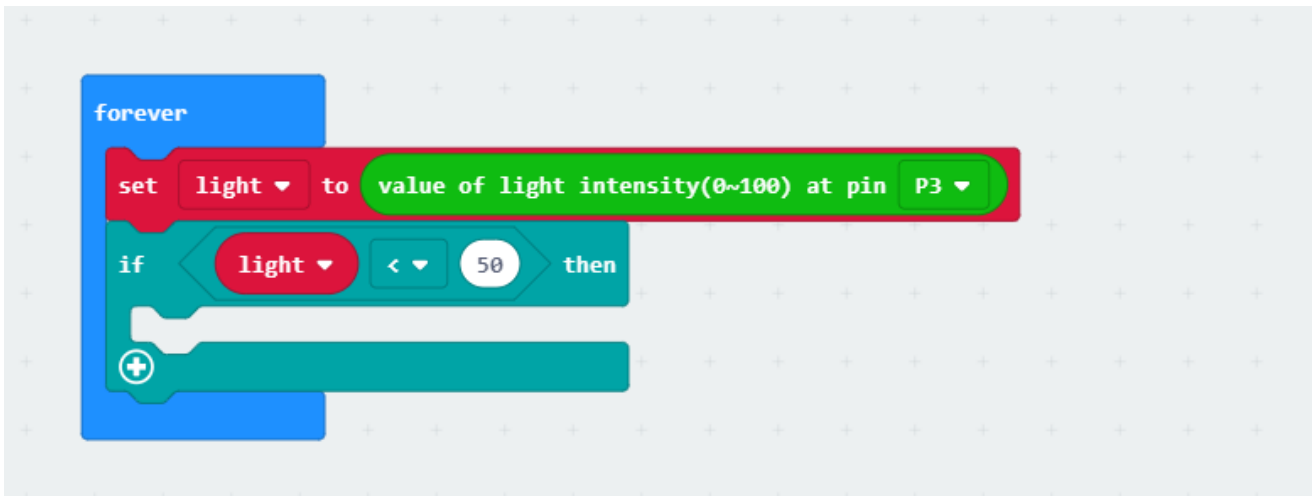
Drag led enable block from LED ,choose false for disabling the LED Array.



## Step 3

Snap "set light to value of light intensity (0~100) at pin P3" into forever block and change the number after light to 50.

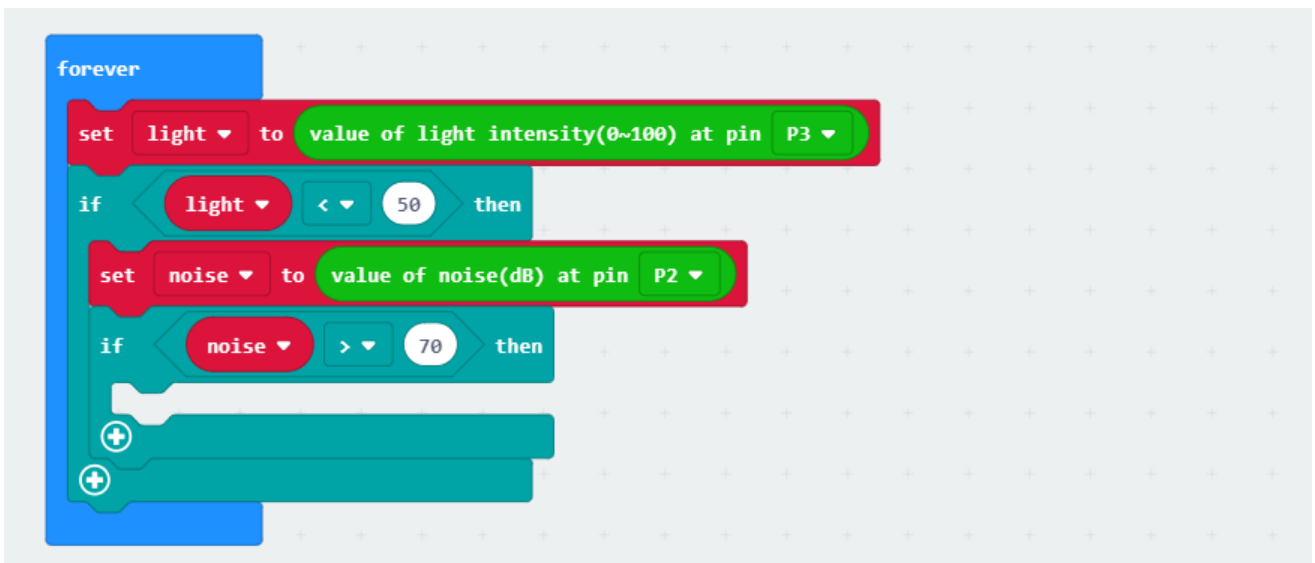
If the value of light intensity more than 50, it is during the day. If the value of light intensity less than 50, it is during the night.



## Step 4

Snap “set noise to vlaue of noise (dB) at pin P2” while the value of light intensity less than 50. Change the number after noise to 70.

Sensor voice by Judging value of noise greater than 70.



## Step 5

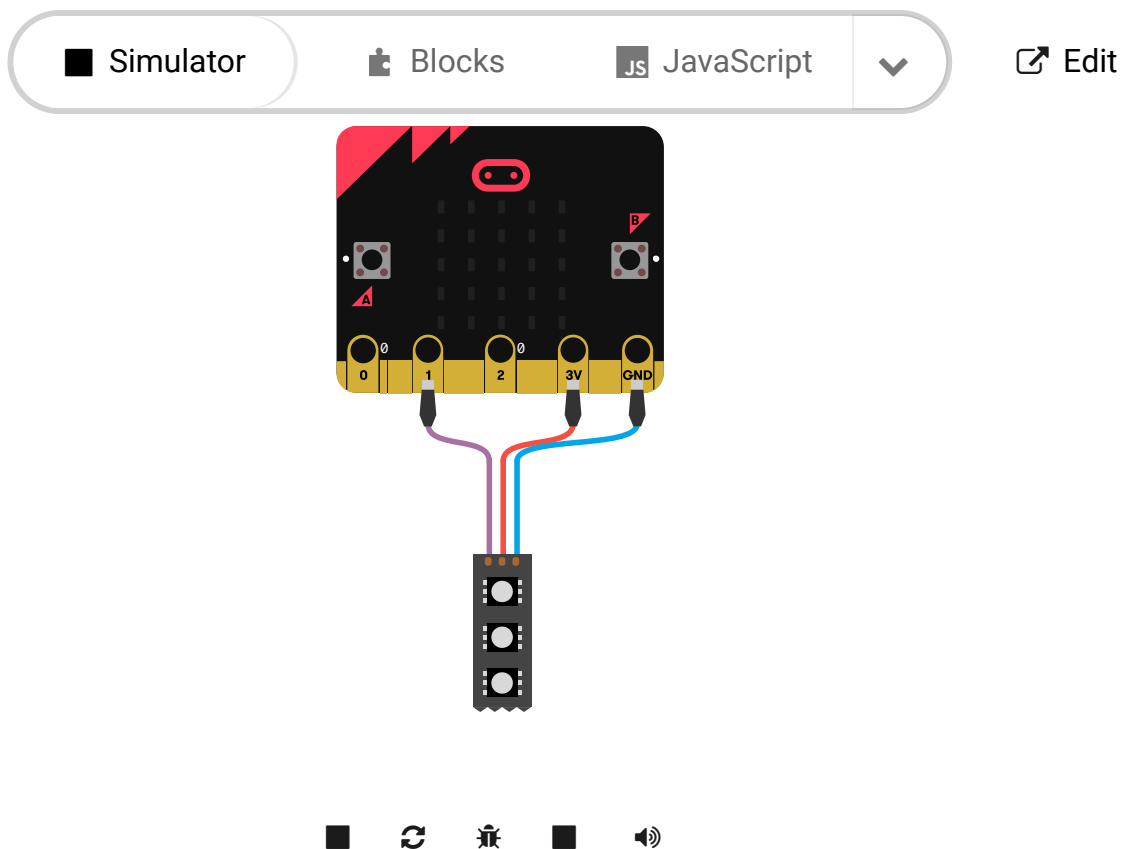
The Rainbow LED shows white light when it sensor value of noise greater than 70 and off after 10 seconds.

```
forever
  set light to value of light intensity(0~100) at pin P3
  if light < 50 then
    set noise to value of noise(dB) at pin P2
    if noise > 70 then
      NeoPixel at pin P1 with 1 leds as RGB (GRB format) show color white
      pause (ms) 10000
      NeoPixel at pin P1 with 1 leds as RGB (GRB format) show color black
```

## Programming

Make code: [https://makecode.microbit.org/\\_14sKK4Kyigs3](https://makecode.microbit.org/_14sKK4Kyigs3)

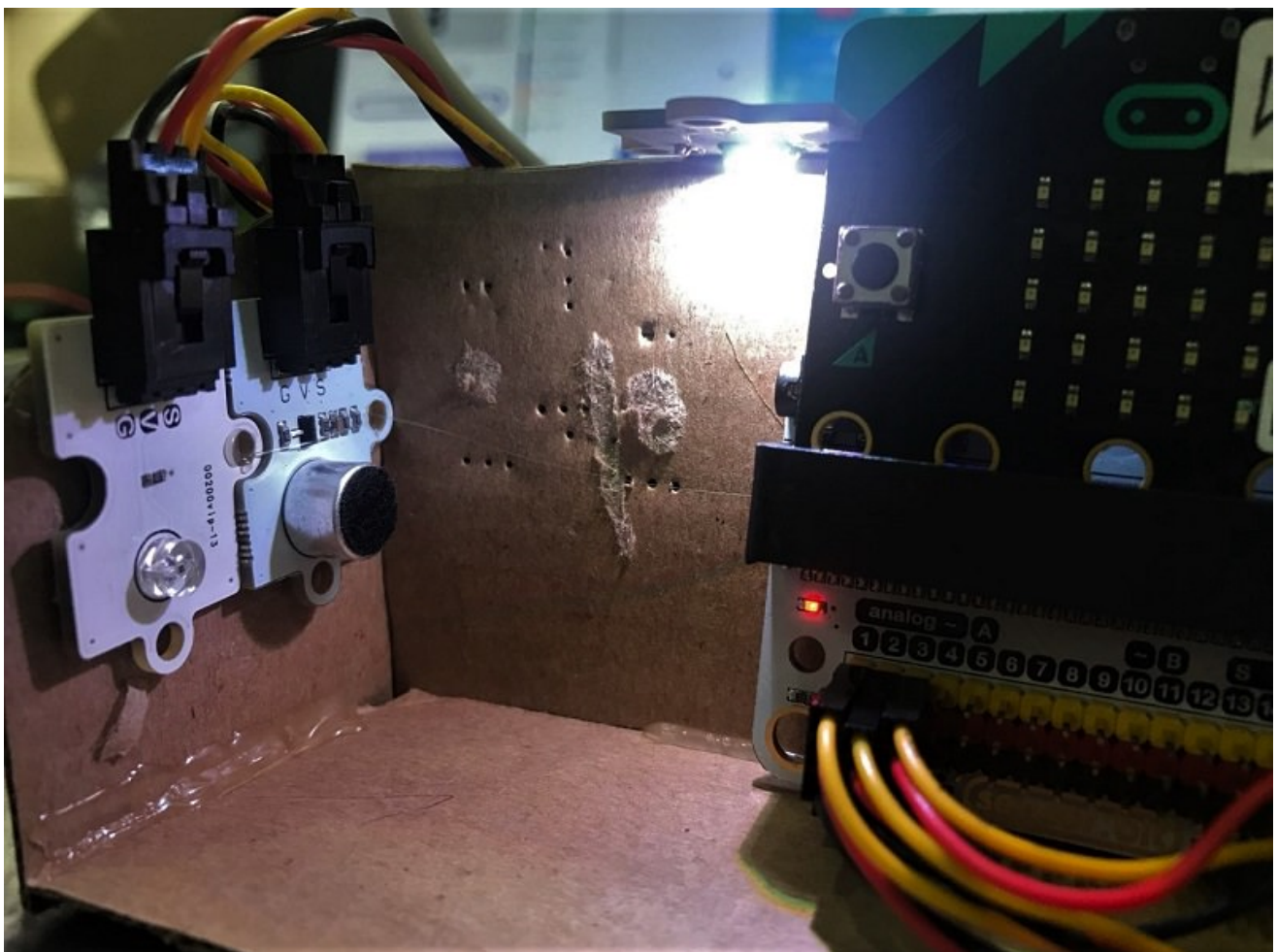
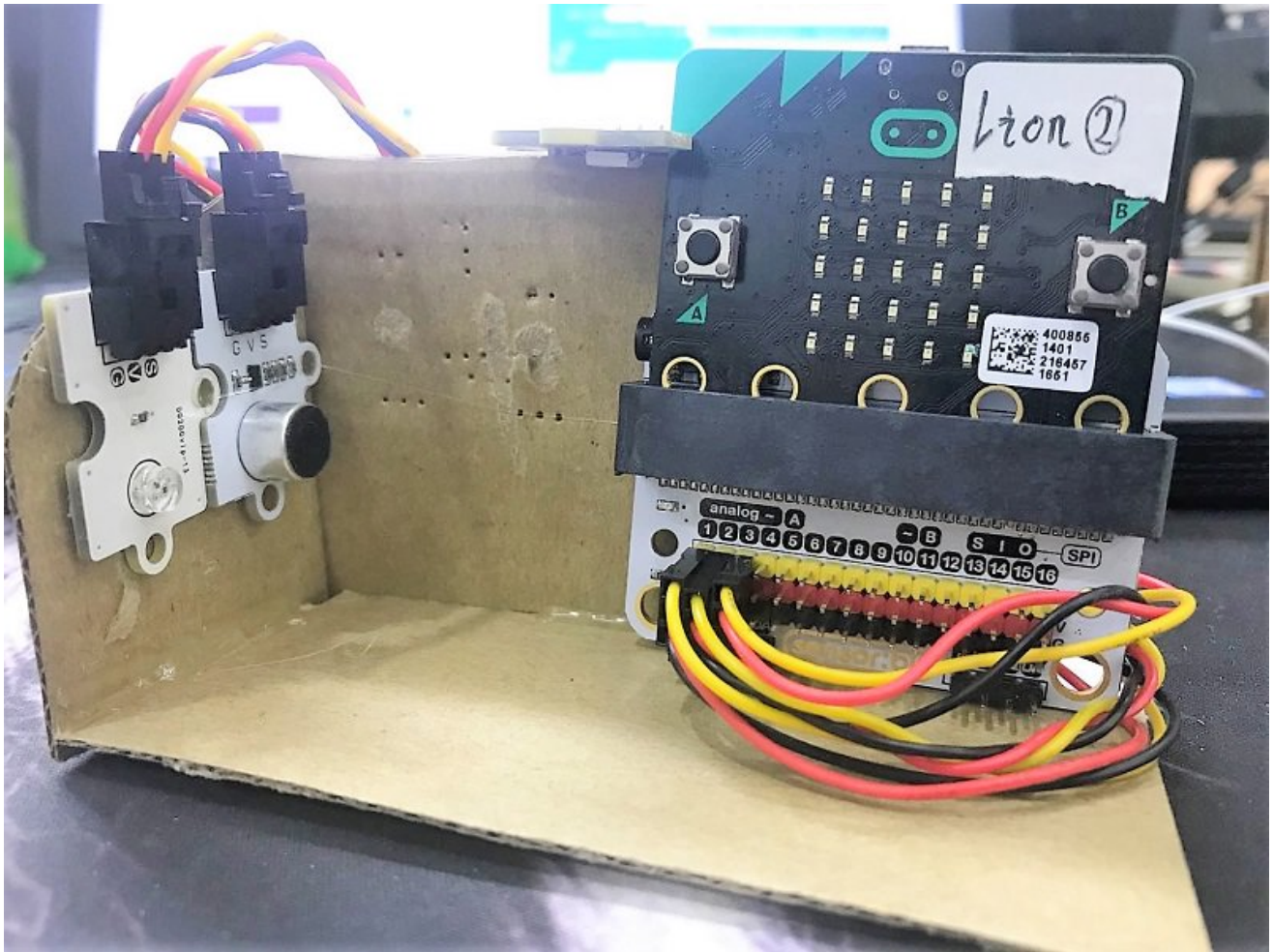
You also could directly download program visit website as below:



--- \*\*Note: \*\* The value of light intensity is base on actual environment.

## 3.8. Result

The light will never up when illumination is adequate. However, slight noise will cause it light 10 seconds during the night.



## 3.9. Think

---

How to use micro:bit make rainbow Led rather solid color light?

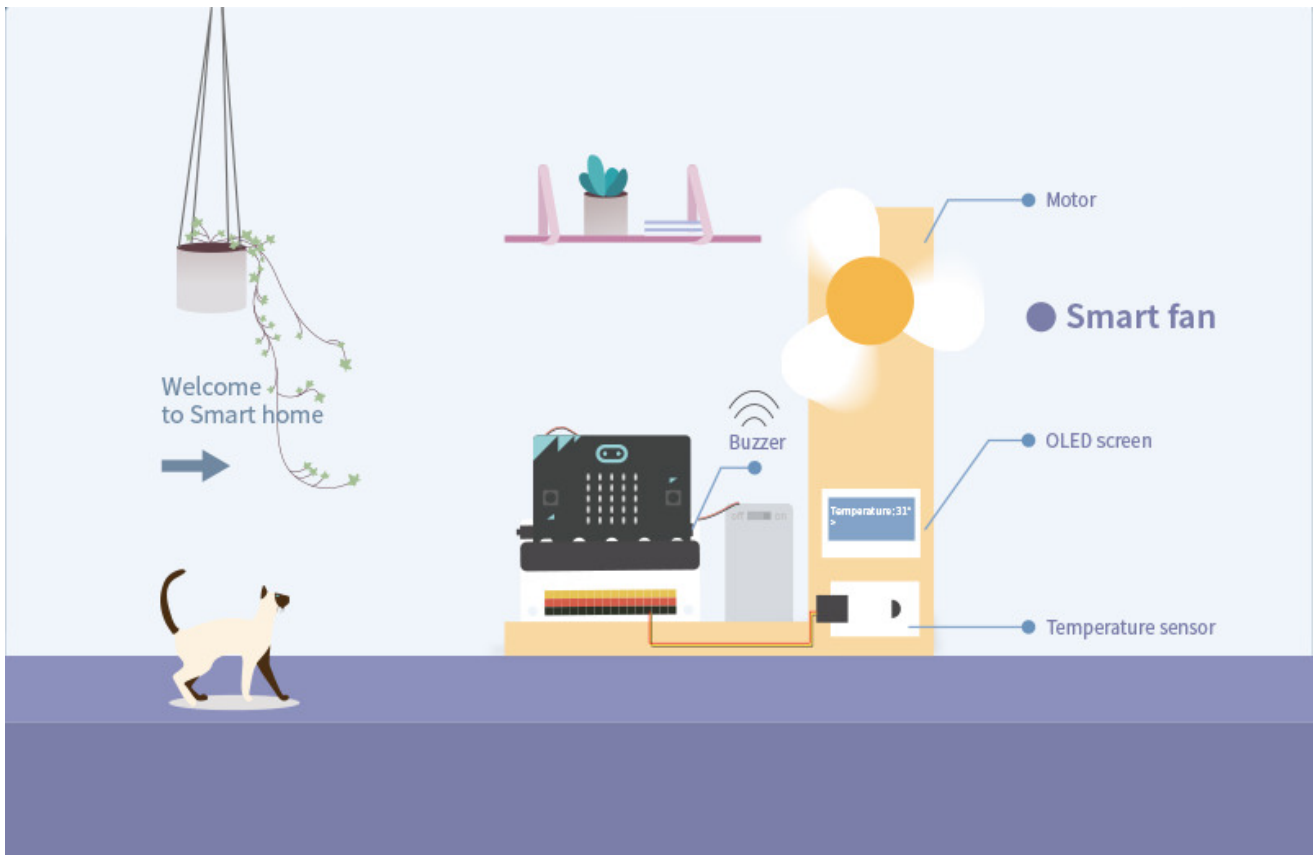
## 3.10. Questions

---

## 3.11. More information

---

## 4. case 02 Smart Fan



### 4.1. Goal

---

- Make a smart temperature control fan.

### 4.2. Materials

---

- 1 x Smart home Kit
- 1 x corrugated board
- 2 x small sticks
- 1 x glue

### 4.3. Background

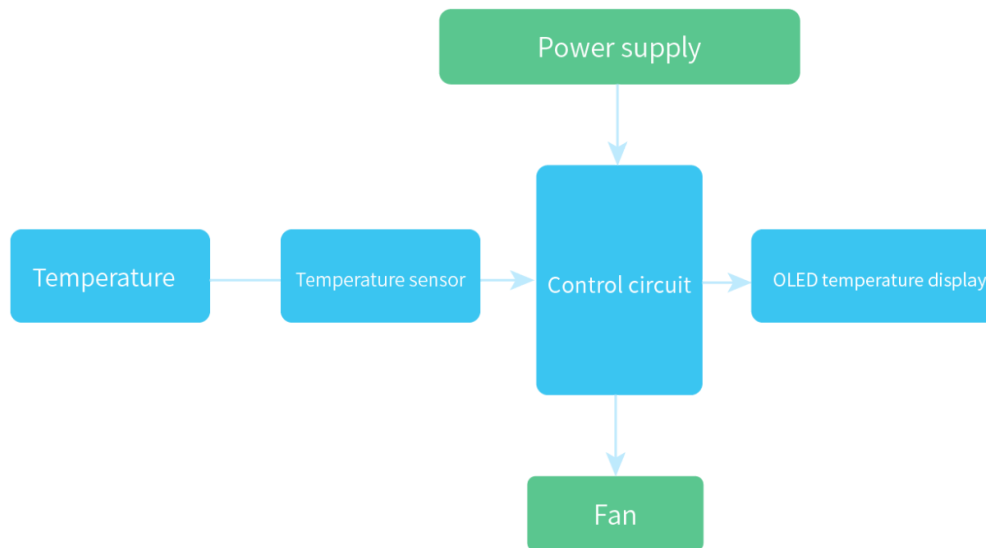
---

###Meaning of smart temperature control fan

- The smart temperature control fan is a created product base on smart home. That's say, science come from life.

## What is smart temperature control fan

- The room will at high temperature when temperature degree is higher than 30° and make people feel uncomfortable. The temperature sensor will send this signal to micro:bit, and micro:bit send this signal to the fan. Then, the fan will drive until the degree of room under 30° to keeping room at comfortable temperature.



## 4.4. Practical operation

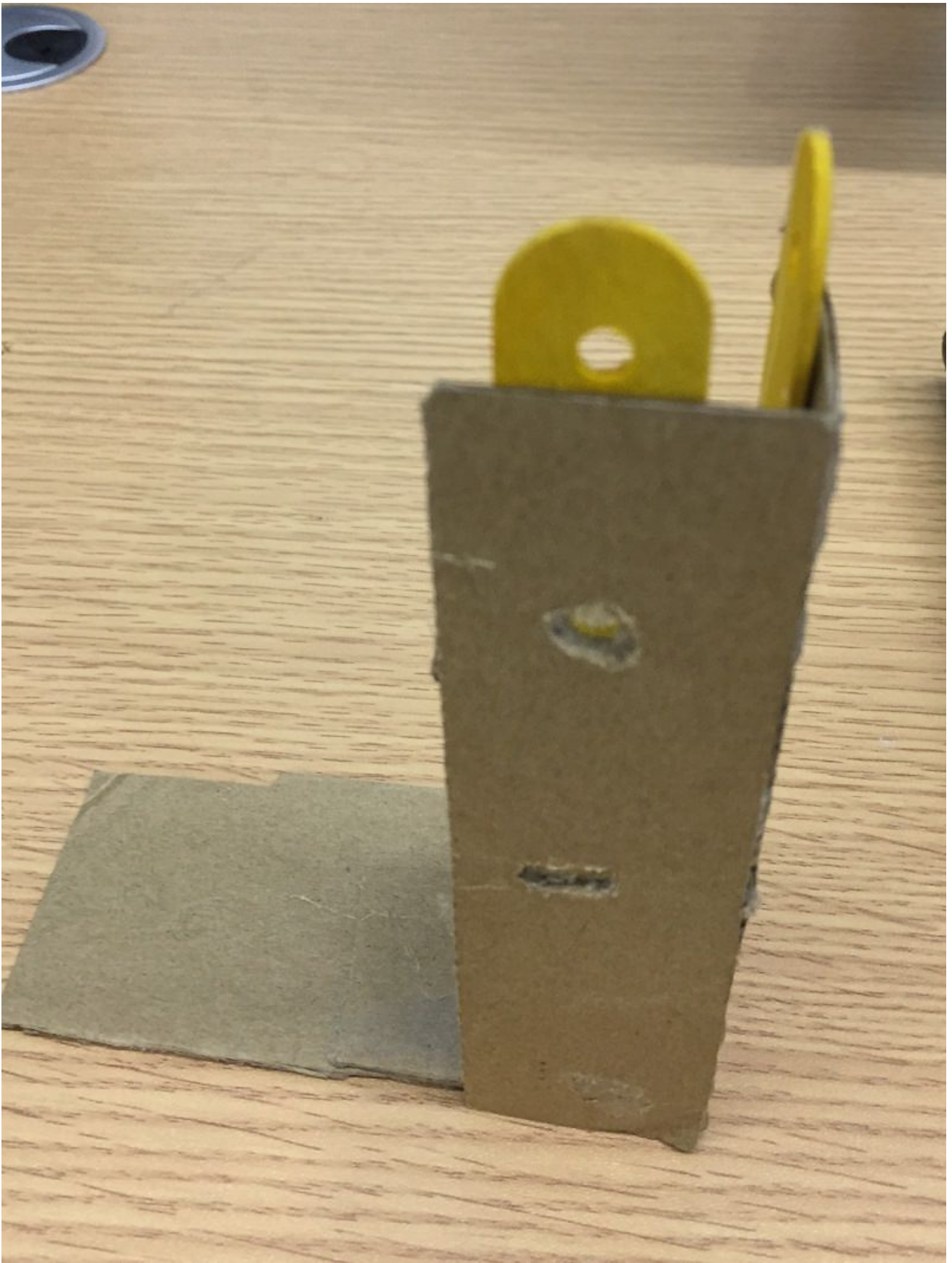
---

Materials: corrugated board and cutter





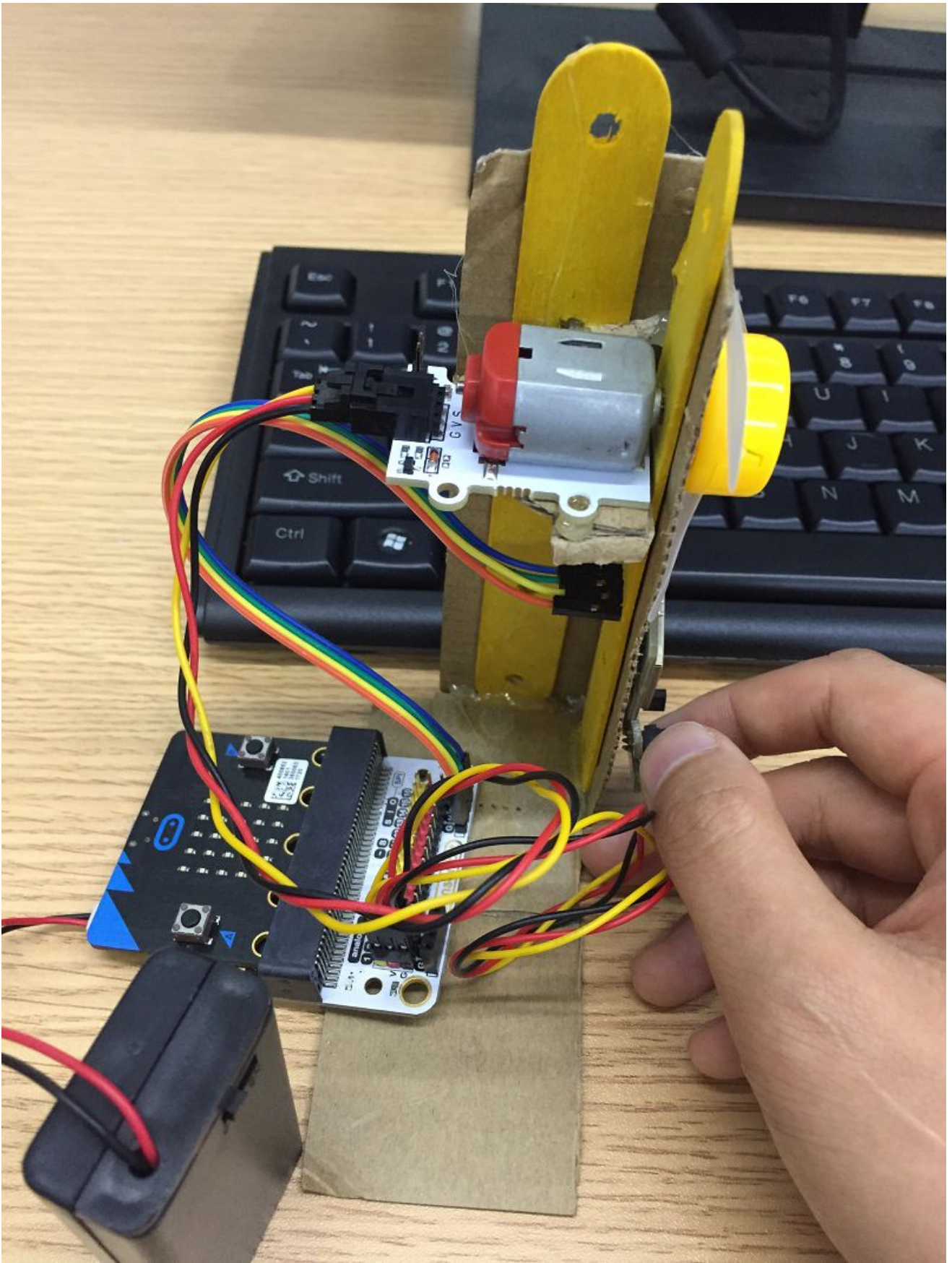
Build as below picture :



Side

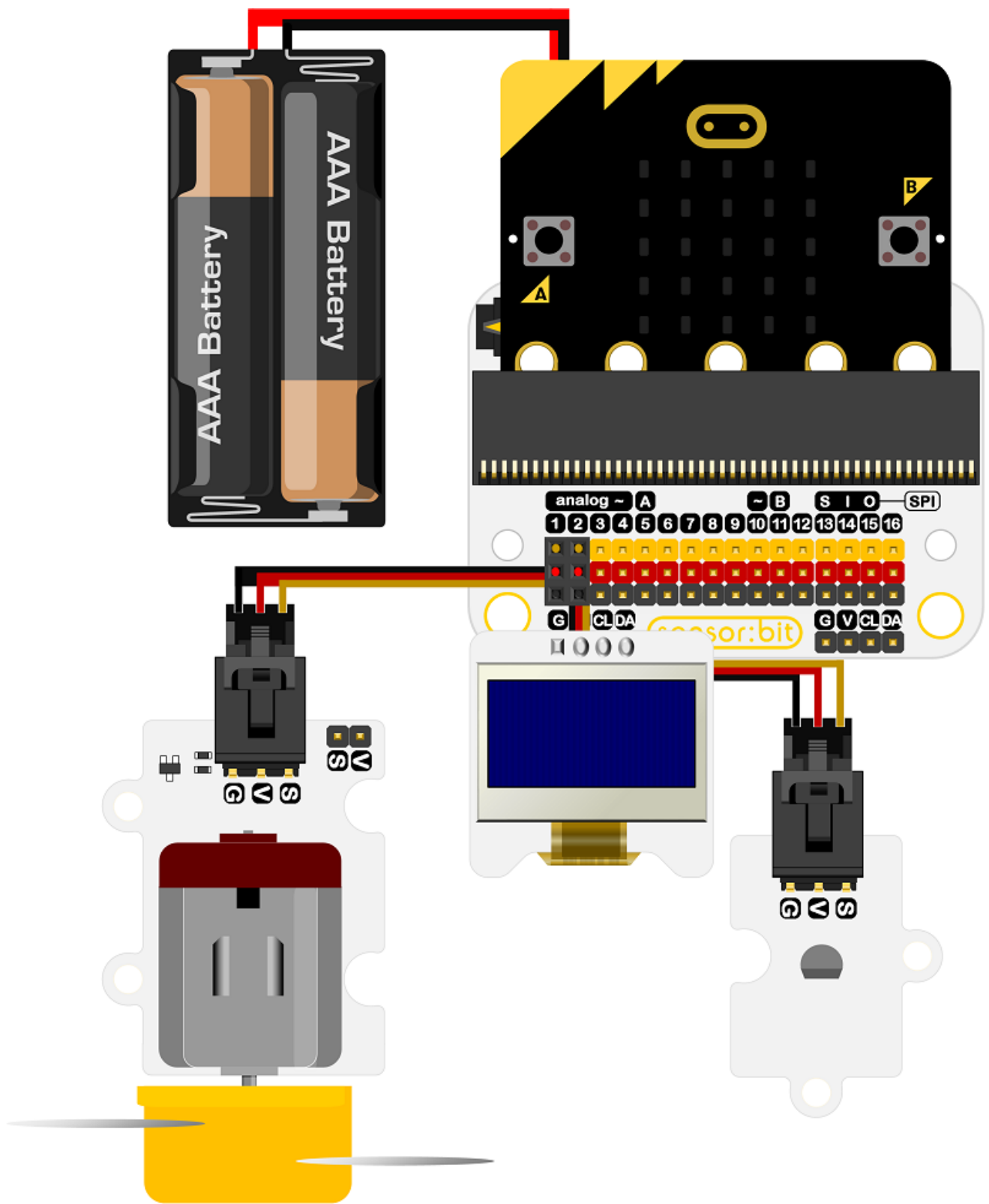


Paste devices as below picture:



**4.5. Hardware connect**

---



## 4.6. Software

---

makecode

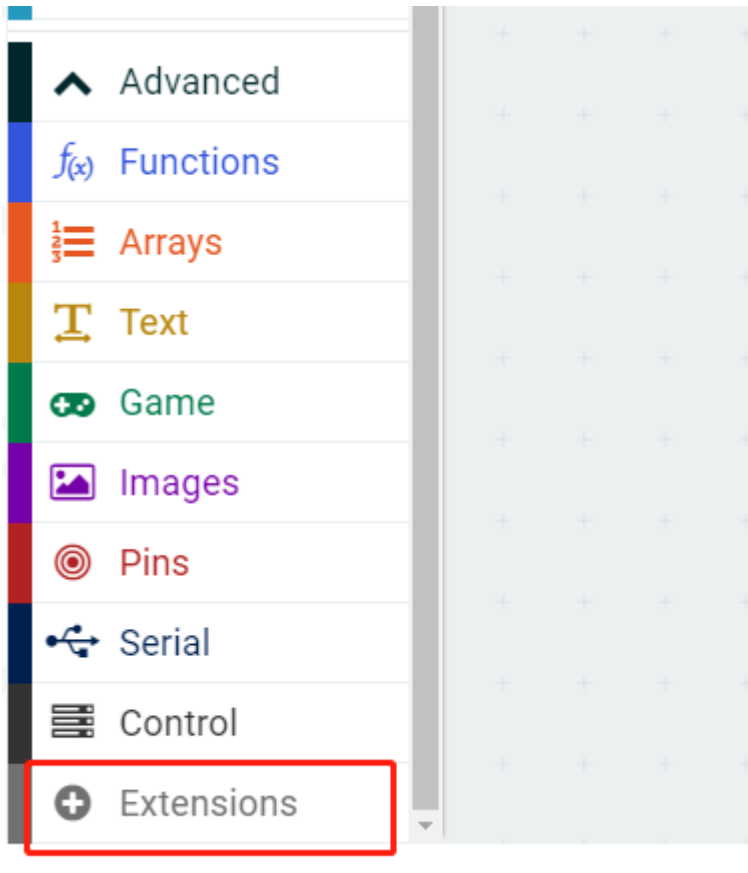
Edge Connector Data Sheet

## 4.7. Programming

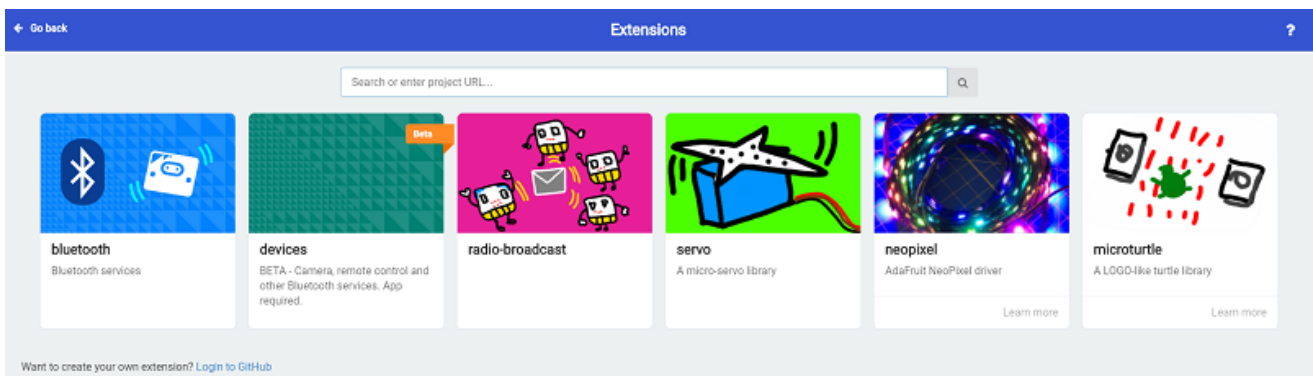
---

## Step 1

Go to MakeCode page, click Advanced in the code block and click on Extensions.



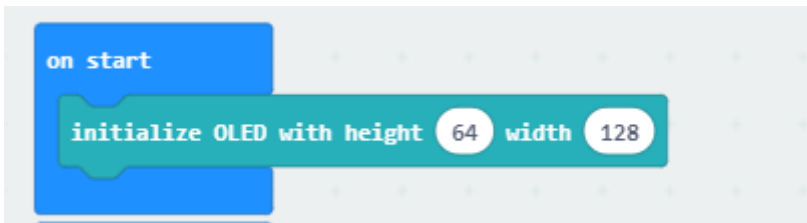
We need to add a new codebase for programming of smart home. Finding “Add Package” in the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



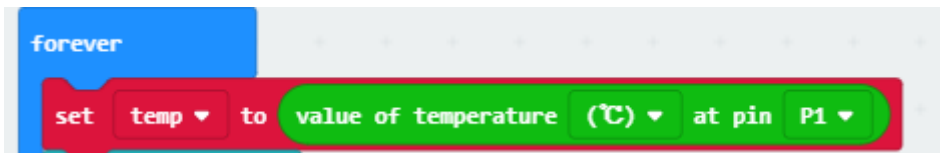
Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in item menu bar.

## Step 2

Drag on start block from Basic and drag initialize OLED block from OLED, change height to 64, width to 128.



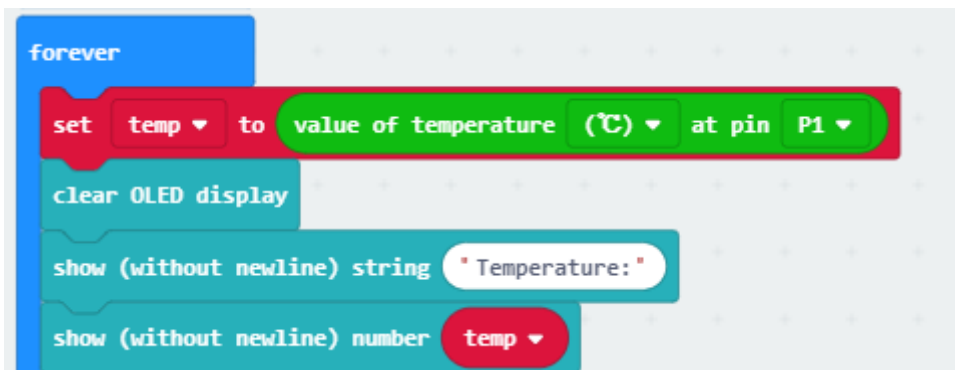
Drag forever block from Basic, add temp variables in Variable, then drag set item to snap into forever, change item to temp and drag value of temperature behind it. Change value of temperature to °C and at pin to P1.



### Step 3

Now let's start OLED code.

Drag clear OLED display under set temp to. Then, drag show (without newline) string 'Temperature' under clear OLED display. Last, drag show(without newline) number temp."Without newline" is for newline displaying string and temperature value.



### Step 4

Our goal is using micro:bit driving the fan when the value of temperature is higher than 30°, so  $temp > 30$  is a judgement condition. In that way, we need drag "if else" from Logic, set  $temp > 30$ .



### Step 5

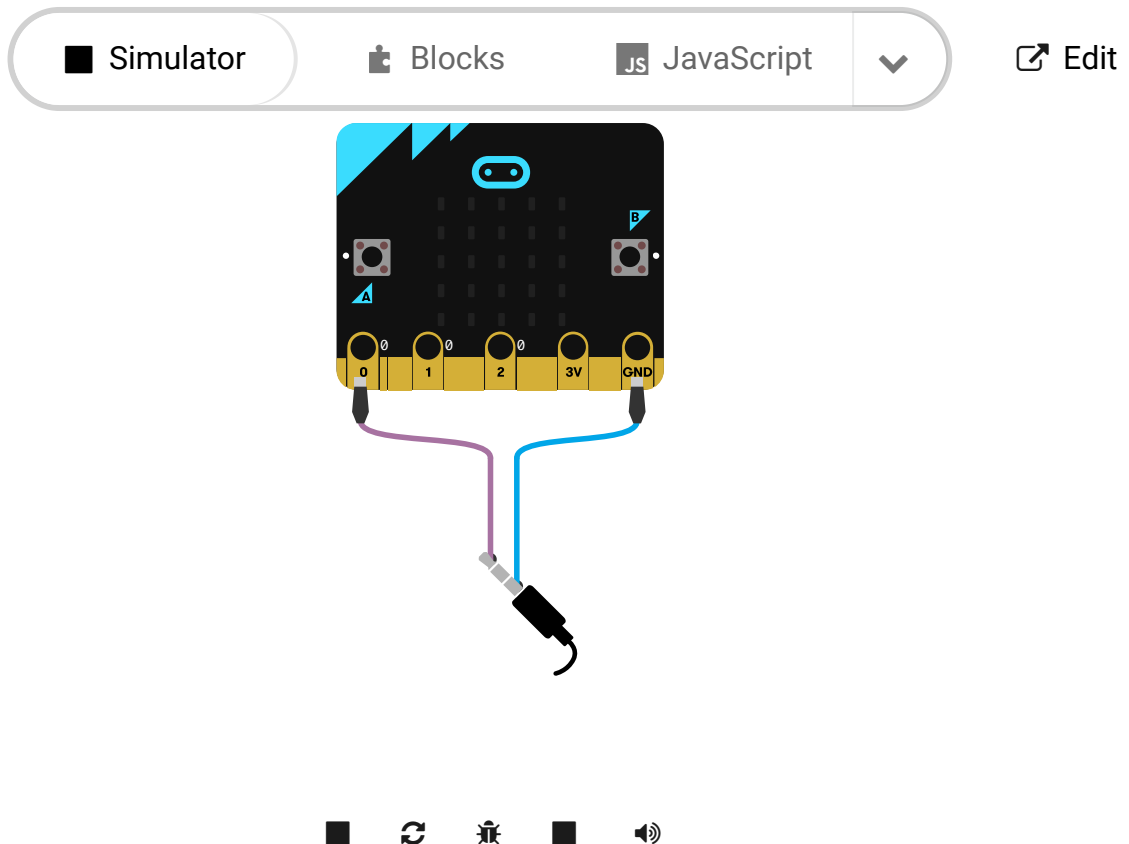
We add start melody repeating under if ,set melody to ba ding and repeat once, micro:bit will send signal to fan through P2. Then set fan works 5 seconds and stops 5 seconds. The temperature sensor judge whether go loop by getting the temperature degree. Else means if above condition were false, the fan will keep rest.

```
if temp > 30 then
  start melody ba ding repeating once
  digital write pin P2 to 1
  pause (ms) 5000
  digital write pin P2 to 0
  pause (ms) 500
else
  digital write pin P2 to 0
```

## Programming

Make code: [https://makecode.microbit.org/\\_PKXir0c1V6TX](https://makecode.microbit.org/_PKXir0c1V6TX)

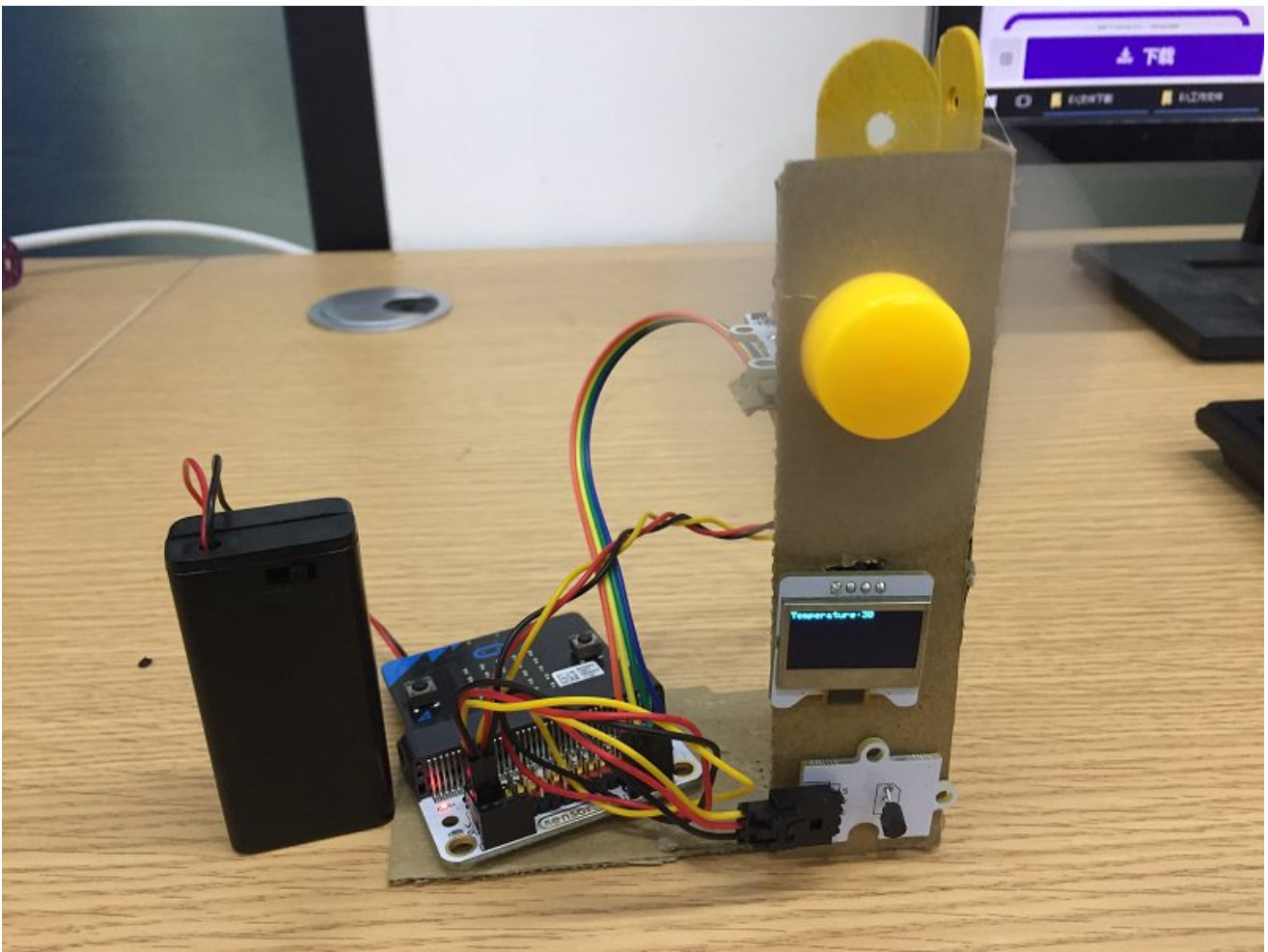
You also could directly download program visit website as below:



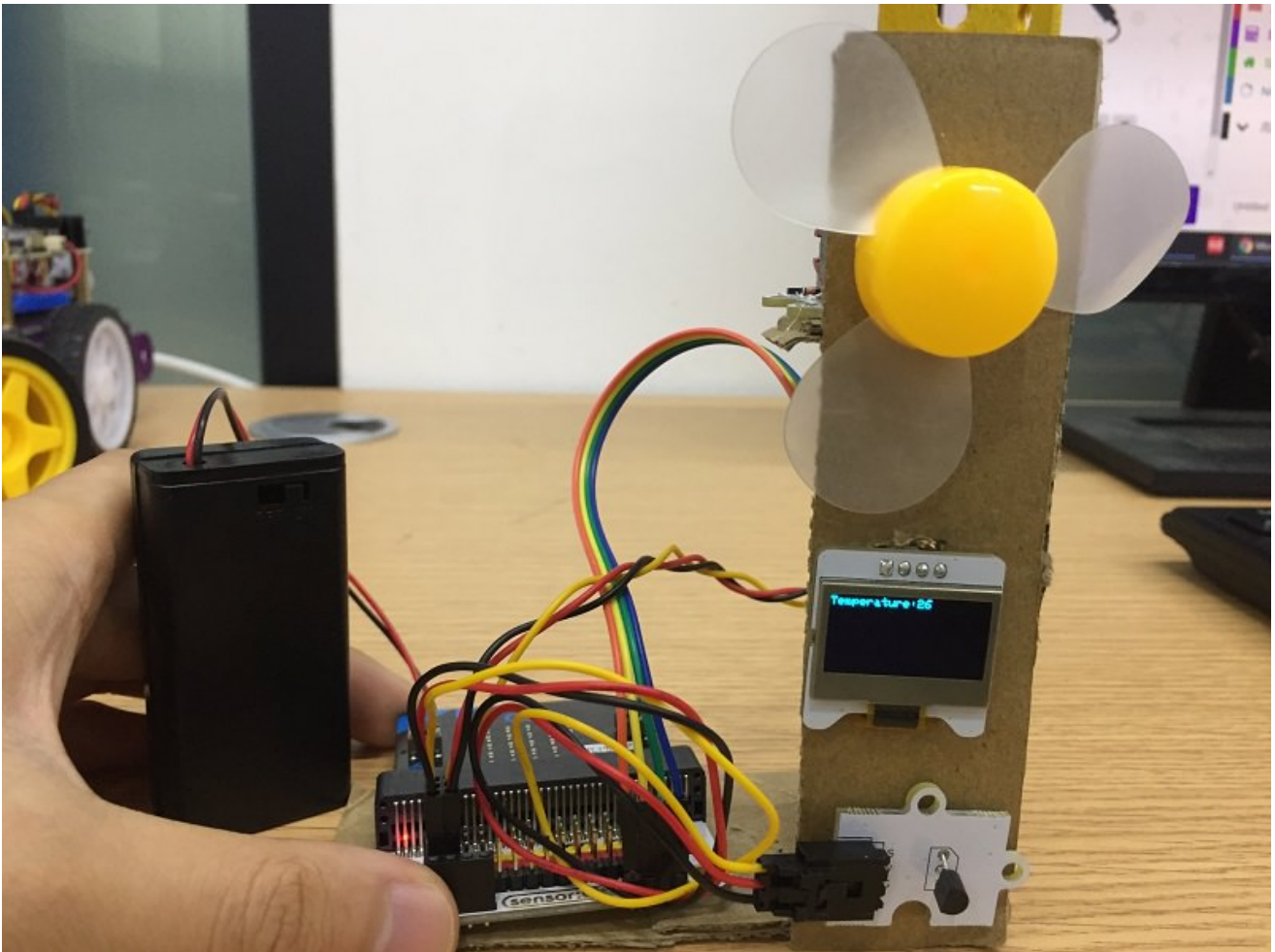
## 4.8. Result

When temperature degree is higher than 30°, buzzer “ba ding” , fan driving to keep room comfortable.





When temperature degree is less than 30°, the fan will automatically stop, and the room at comfortable temperature.



## 4.9. Think

---

How to adjust speed of fan to control cooling rate in the room.

## 4.10. Questions

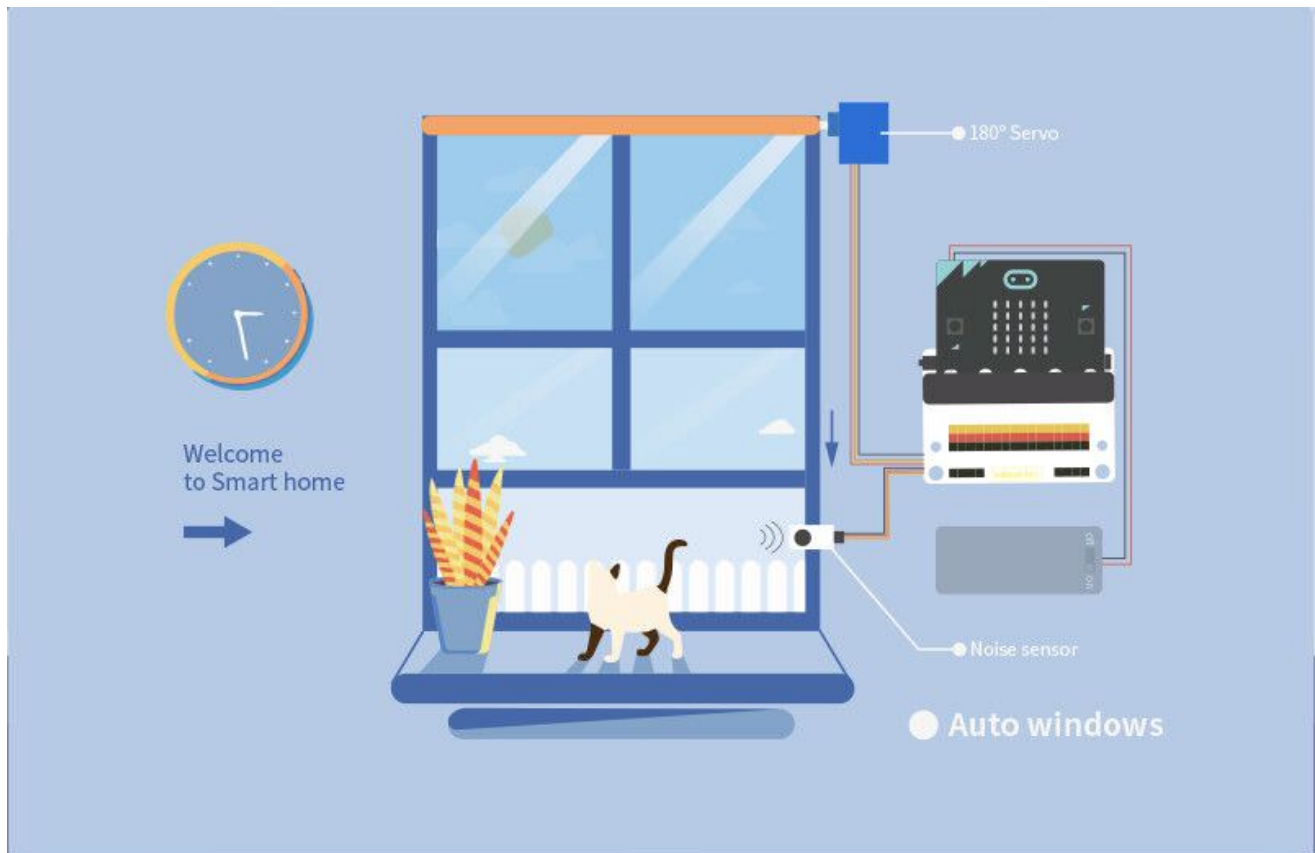
---

- It works well if powering by the USB only without the battery holders, but if the current temperature is over the threshold value, the fan doesn't.
- If powering by the battery holders only without the USB, the fan works well and the detected temperature will be slightly higher than the real one.
- If powering by the battery holders and the USB simultaneously, the fan works well and it gets the normal temperature( Do note that you have to detect the temperature under the premise of the motor fan doesn't drive).

## 4.11. More information

---

## 5. case 03 Auto Windows



### 5.1. Goal

- Make a smart wardrobe

### 5.2. Materials

- 1 x Smart home Kit
- 1 x corrugated board

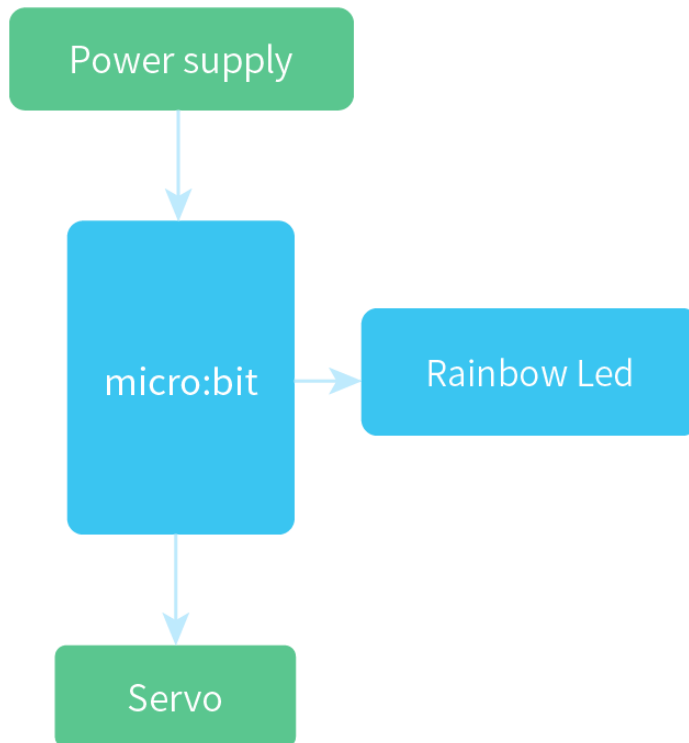
### 5.3. Background

#### What is smart wardrobe

- Smart wardrobe could automatically open and let people take cloth. A slight push and the door open. At the same time, wardrobe door was setted low noise, it will not disturb sleep.

## Smart wardrobe operation

- Controlling crash detect module using micro:bit and receive crash signal. The micro:bit will control servo to open the door with light up when it received signal.



## 5.4. Practical operation

---

Materials: corrugated board and cutter

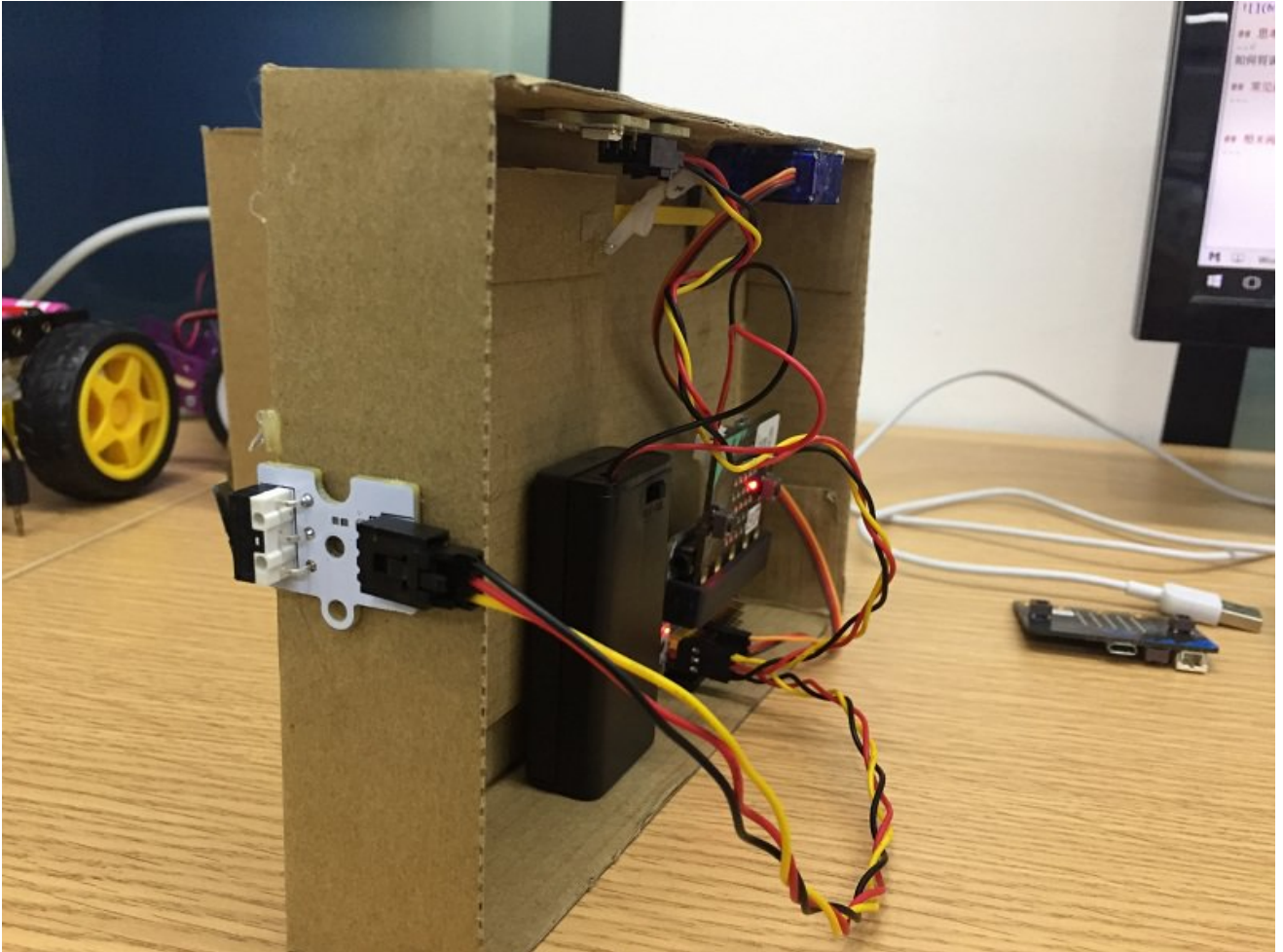


Build as below picture :

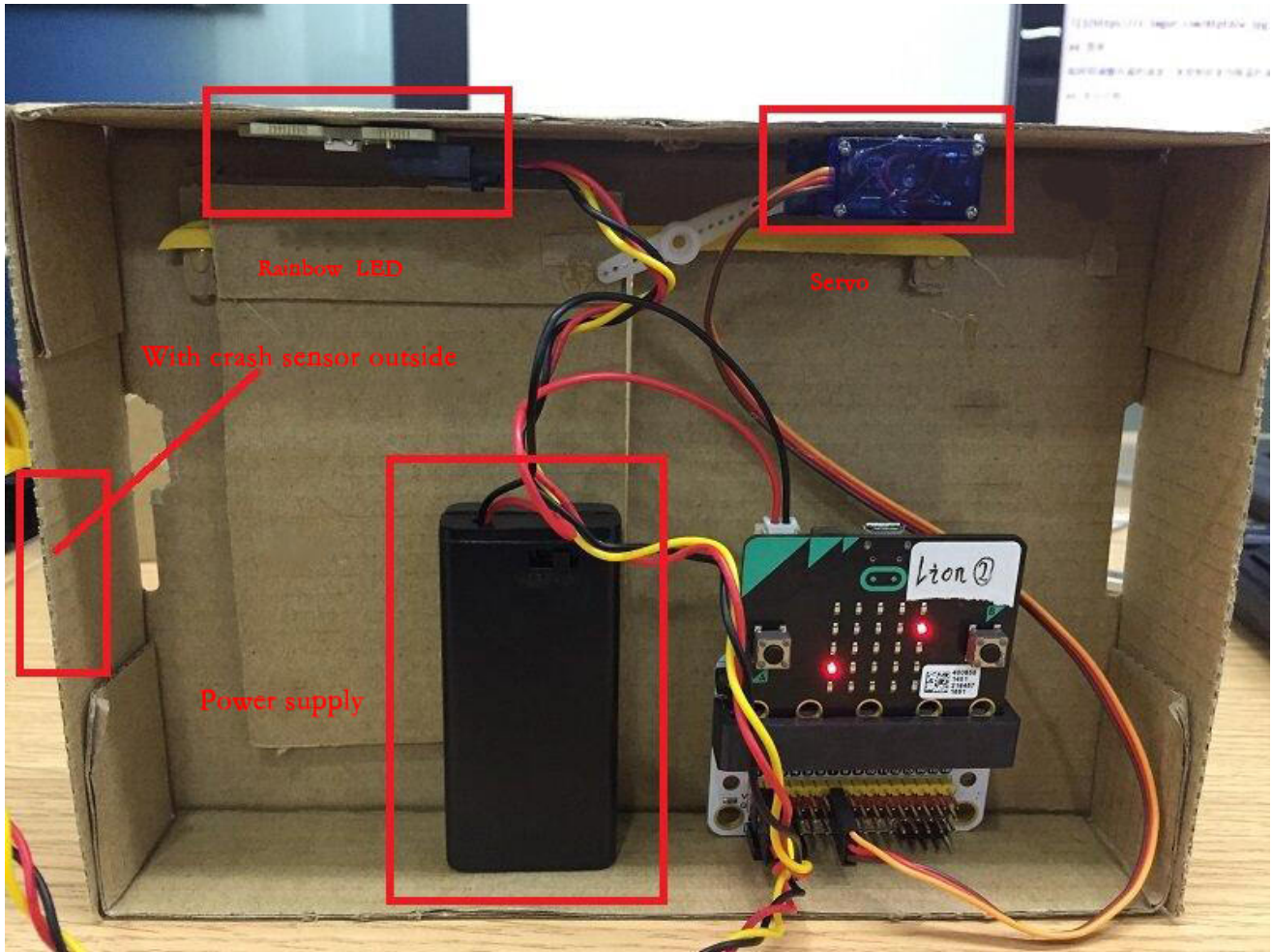
Front side :



Back side:

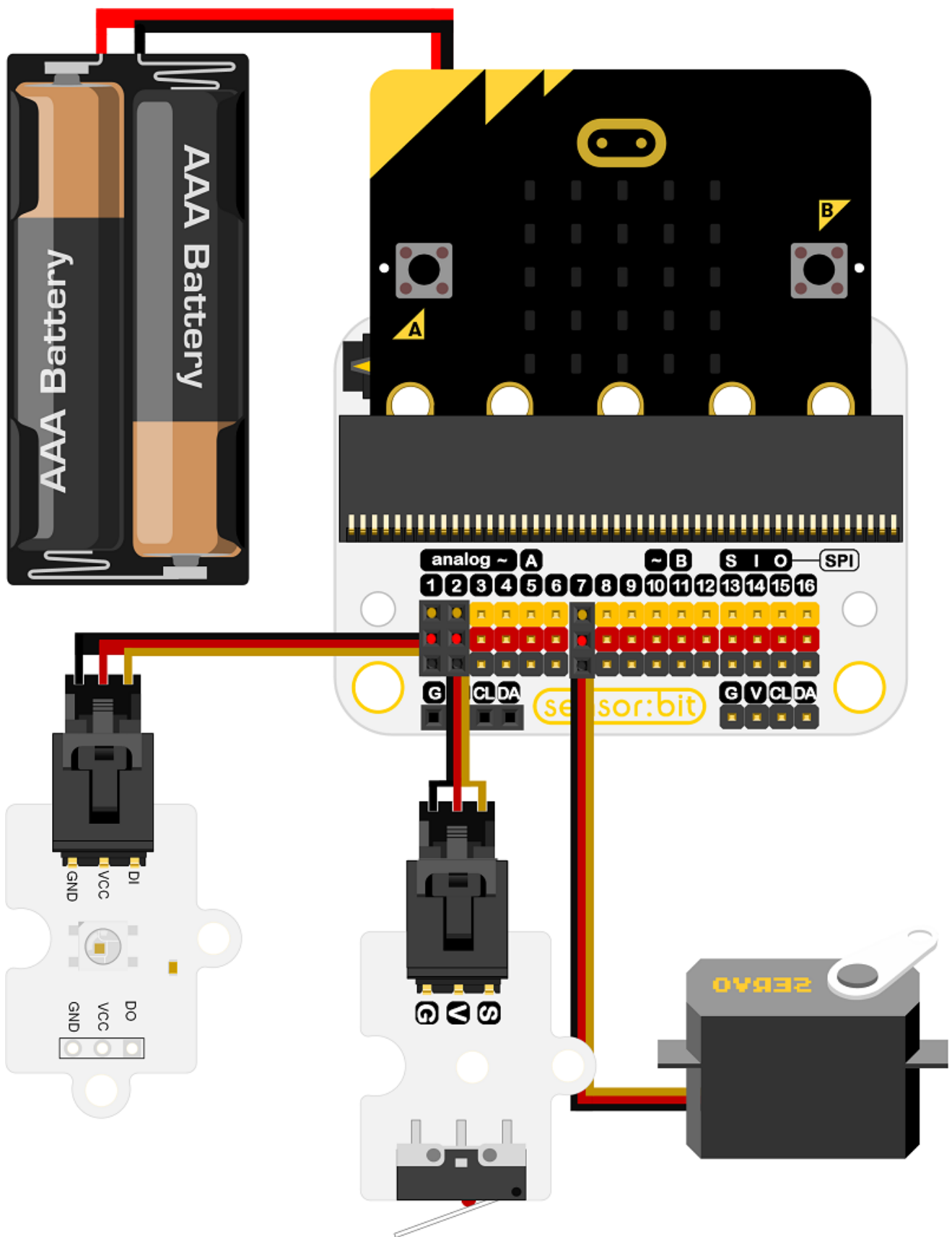


Paste devices as below picture:



## 5.5. Hardware connect

---



## 5.6. Software

makecode

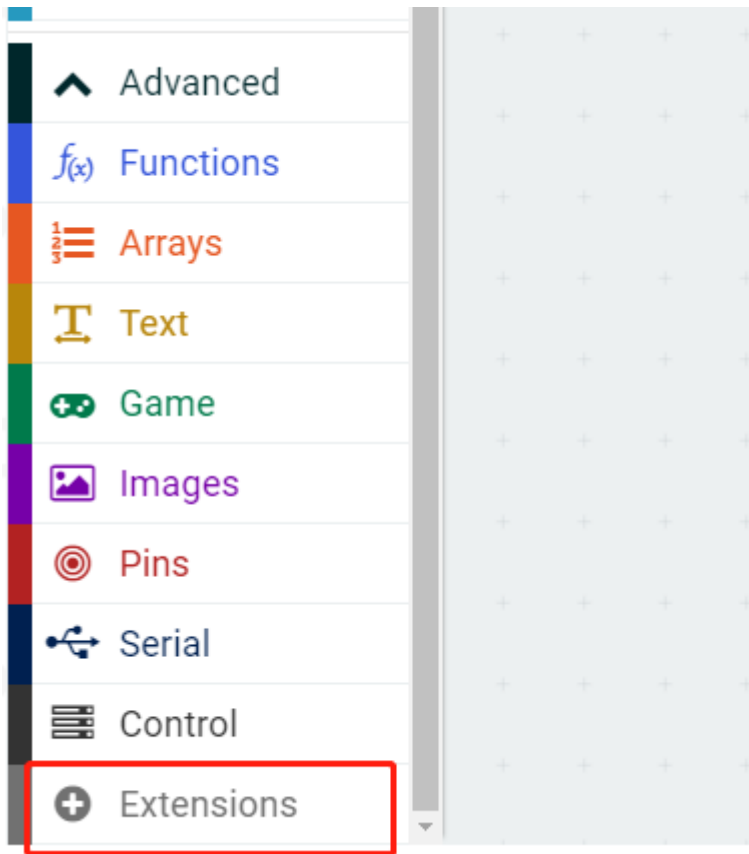
Edge Connector Data Sheet



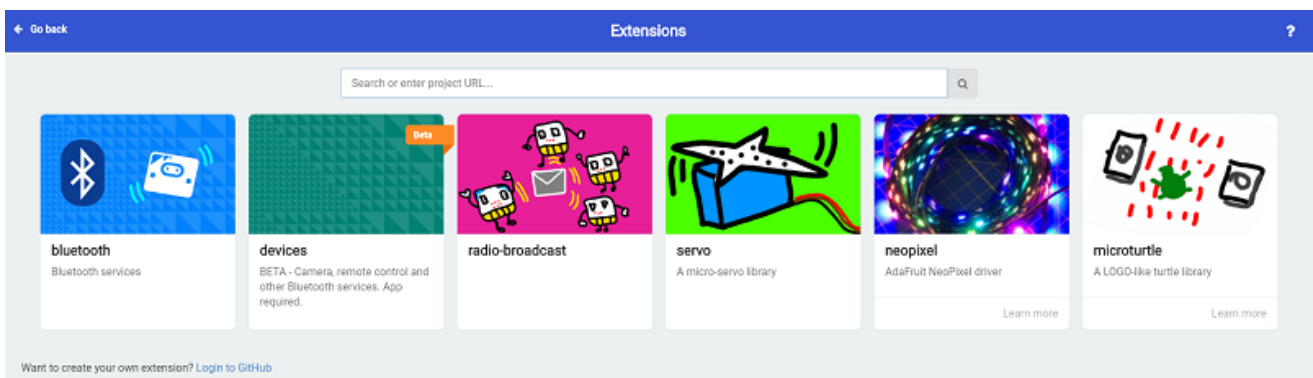
# 5.7. Programming

## Step 1

Go to MakeCode page, click Advanced in the code block and click on Extensions.



We need to add a new codebase for programming of smart home. Finding “Add Package” in the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in item menu bar.

## Step 2

Drag on start from Basic and snap into set pull pin P2 to up.

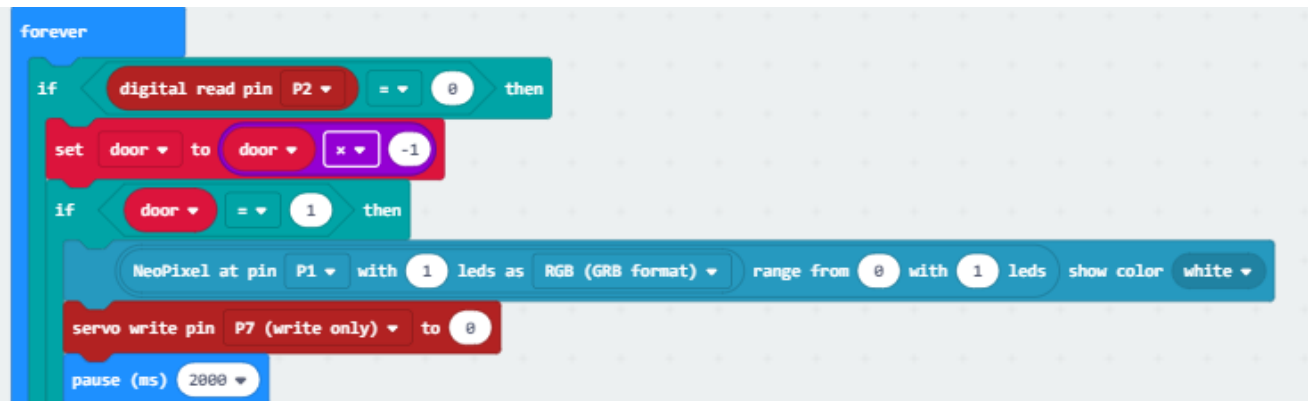
Drag servo write pin from Pin, choose P7, set P7 to 180° and set door to -1 for closing the door.



```
on start
  set pull pin P2 to up
  servo write pin P7 (write only) to 180
  set door to -1
```

### Step 3

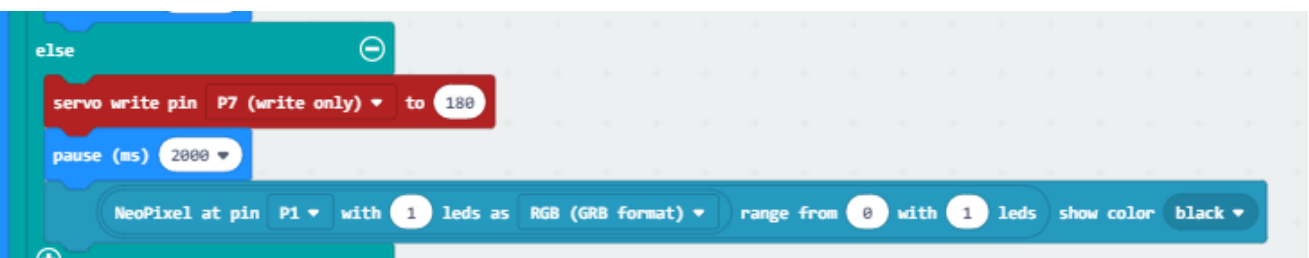
If digital read P2, the door variables will be contrary. If door variables is true, rainbow LED shows white, servo turns 0° with door opens and pause 2 seconds.



```
forever
  if digital read pin P2 = 0 then
    set door to door * -1
  if door = 1 then
    NeoPixel at pin P1 with 1 leds as RGB (GRB format) range from 0 with 1 leds show color white
    servo write pin P7 (write only) to 0
    pause (ms) 2000
```

### Step 4

If door variables is false, servo turns 180° with door closes, pause 2 seconds and the rainbow LED off.

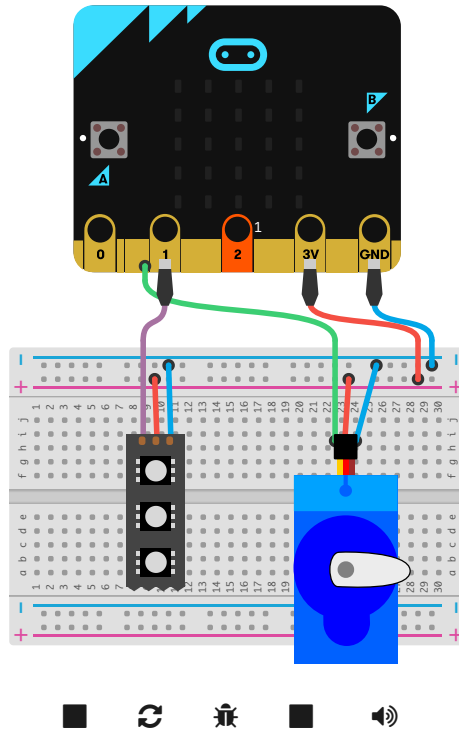


```
else
  servo write pin P7 (write only) to 180
  pause (ms) 2000
  NeoPixel at pin P1 with 1 leds as RGB (GRB format) range from 0 with 1 leds show color black
```

## Programming

Make code: [https://makecode.microbit.org/\\_2J3VR42c29cw](https://makecode.microbit.org/_2J3VR42c29cw)

You also could directly download program visit website as below:



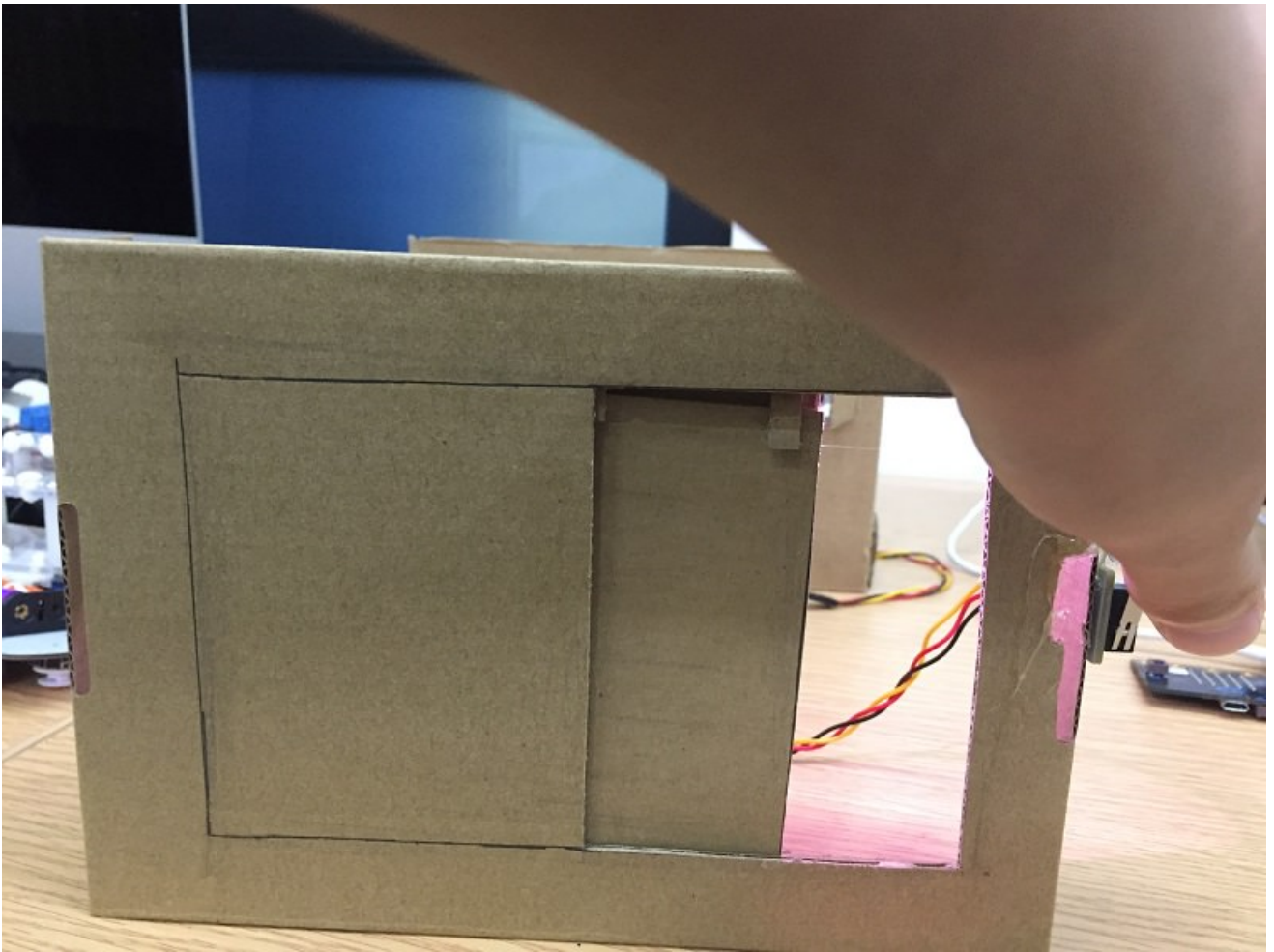
---

## 5.8. Result

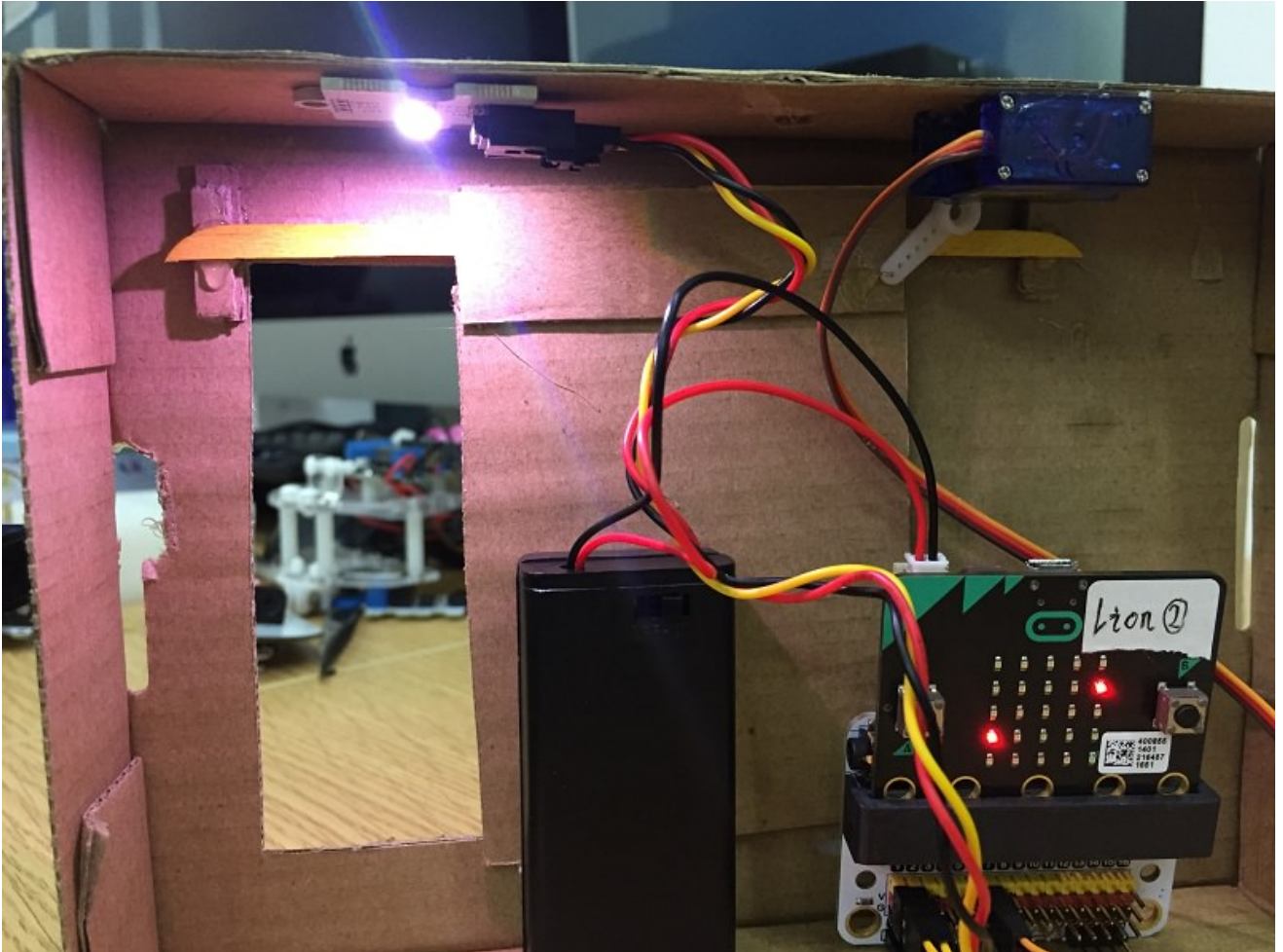
---

Turning of the servo will drive the door open with rainbow led light up.

Front side:



Back side:



## **5.9. Think**

---

How to make a clothes racks ?

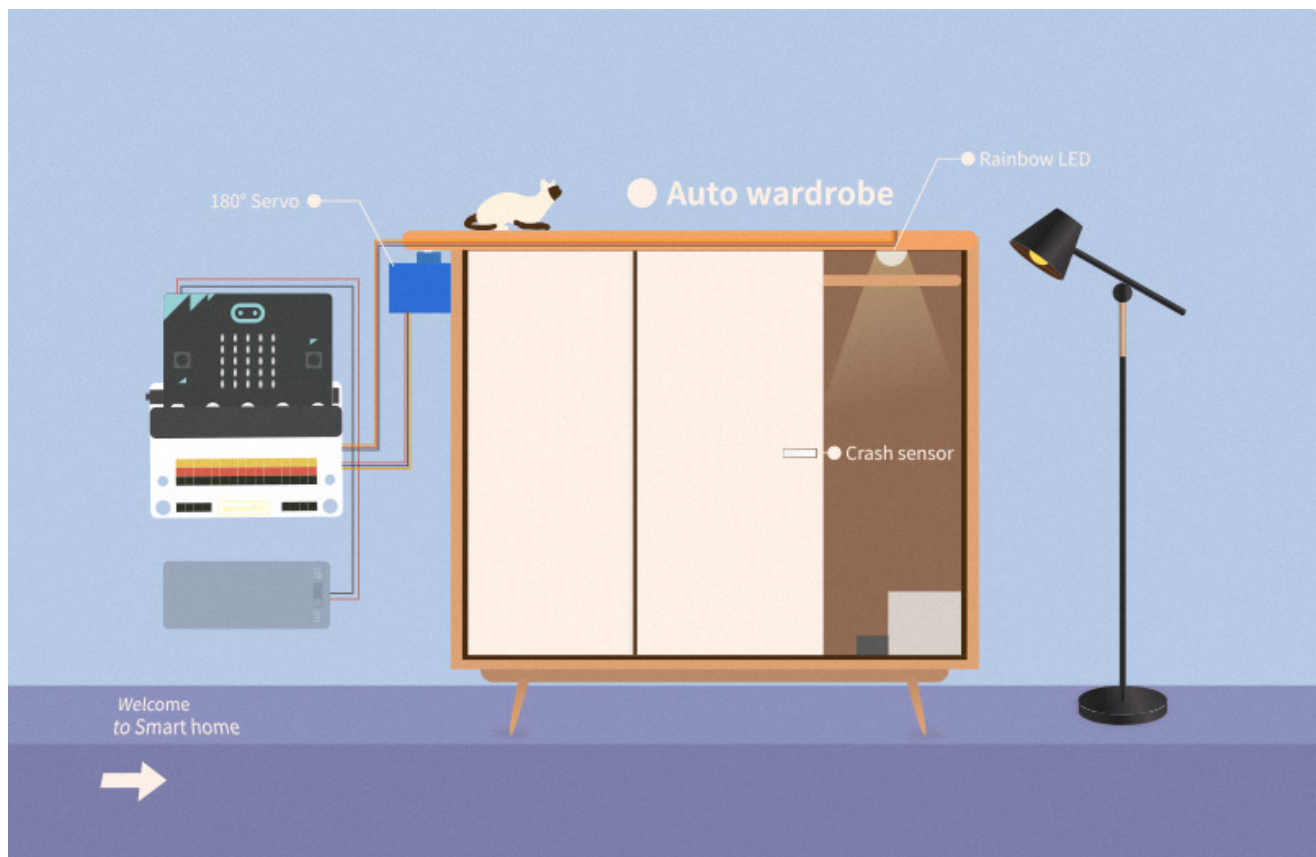
## **5.10. Questions**

---

## **5.11. More information**

---

## 6. case 04 Smart Wardrobe



### 6.1. Goal

---

- Make an auto window.

### 6.2. Materials

---

- 1 x Smart home Kit
- 1 x corrugated board

### 6.3. Background

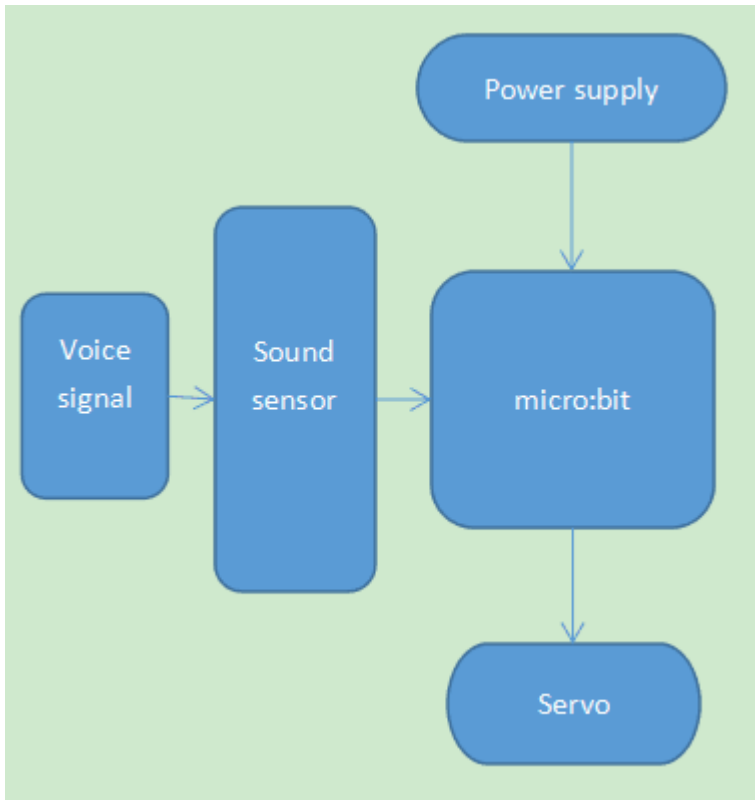
---

#### What is an auto window ?

- Noise pollution is a common problem in our life. When the value of noise higher than 70dB, it is will impact our health. We will design a smart window and door using micro:bit.

## Auto window operation

- Using micro:bit detect whether the value of noise is higher than 70dB and control servo to closing the door and the window.



## 6.4. Practical operation

---

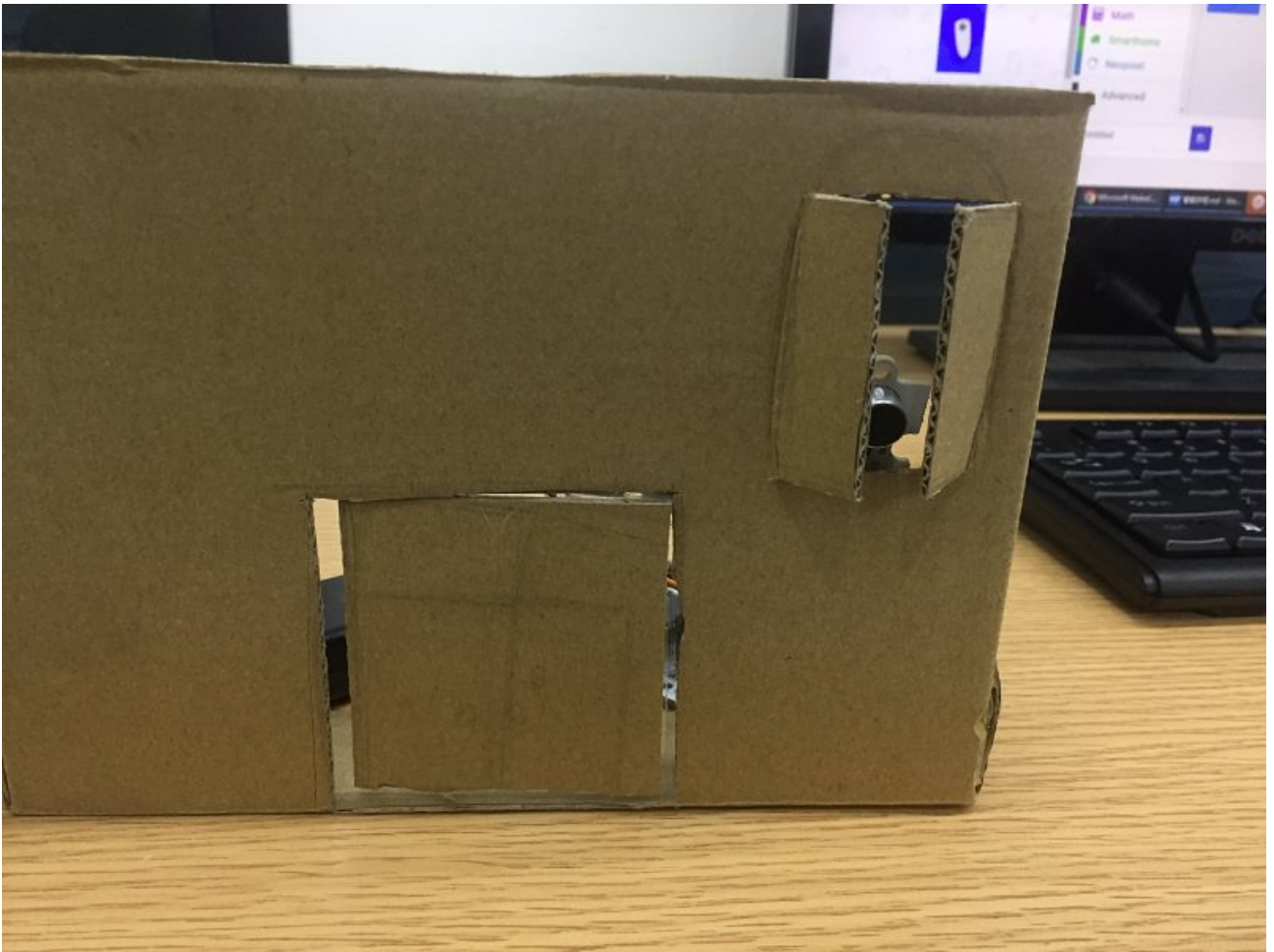
Materials: corrugated board and cutter



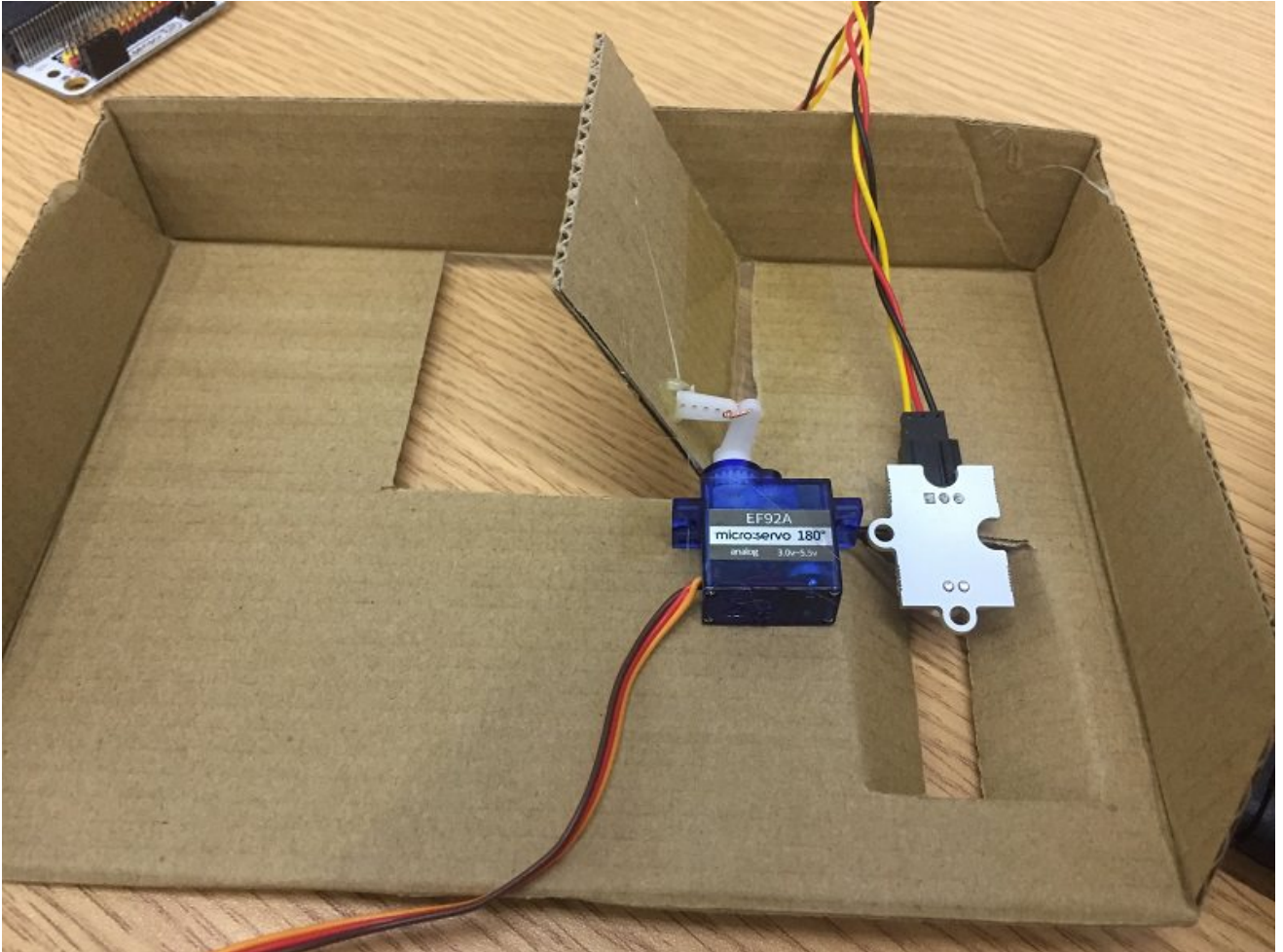
Build as below picture :

Front side :

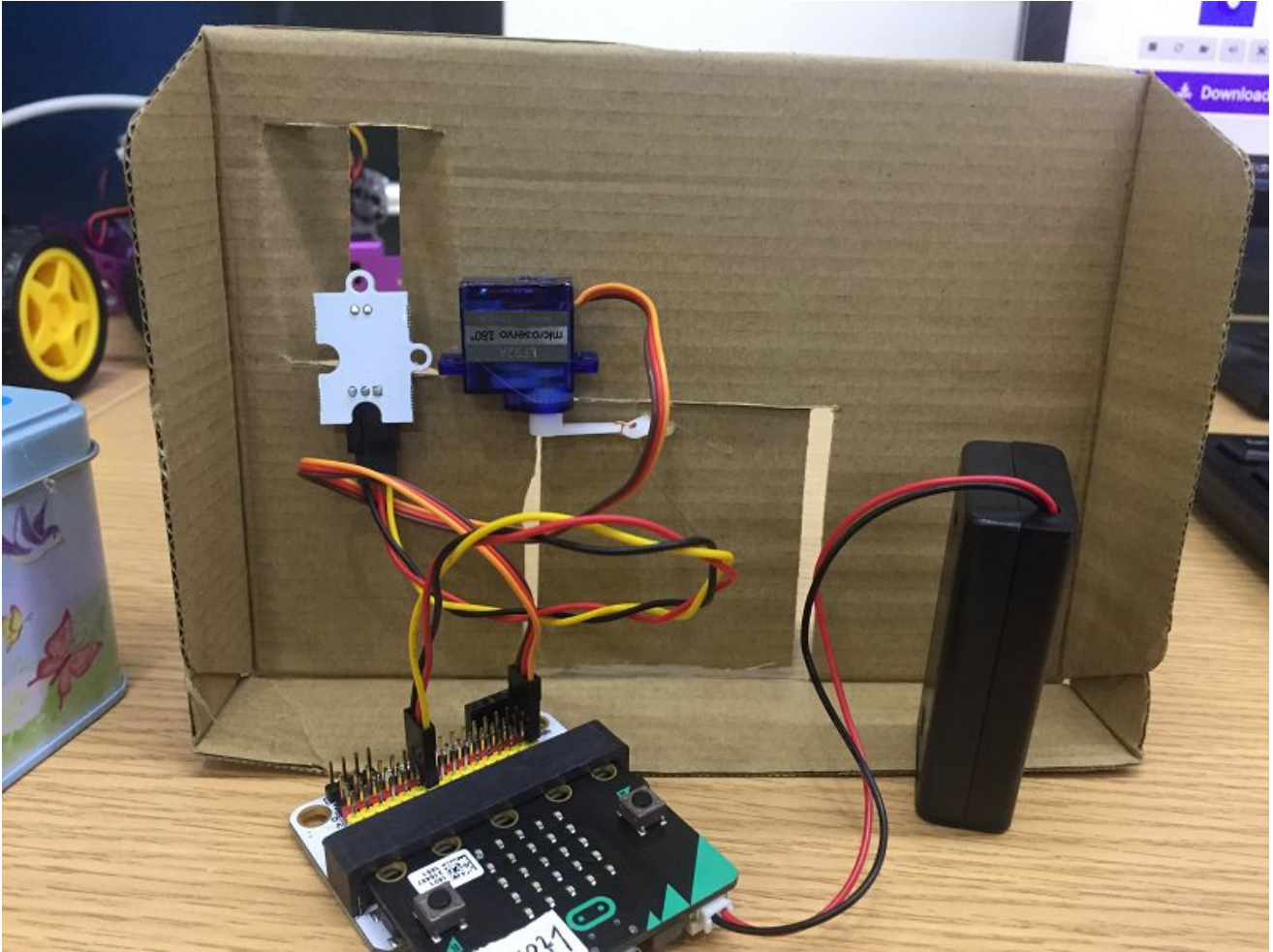




Back side:

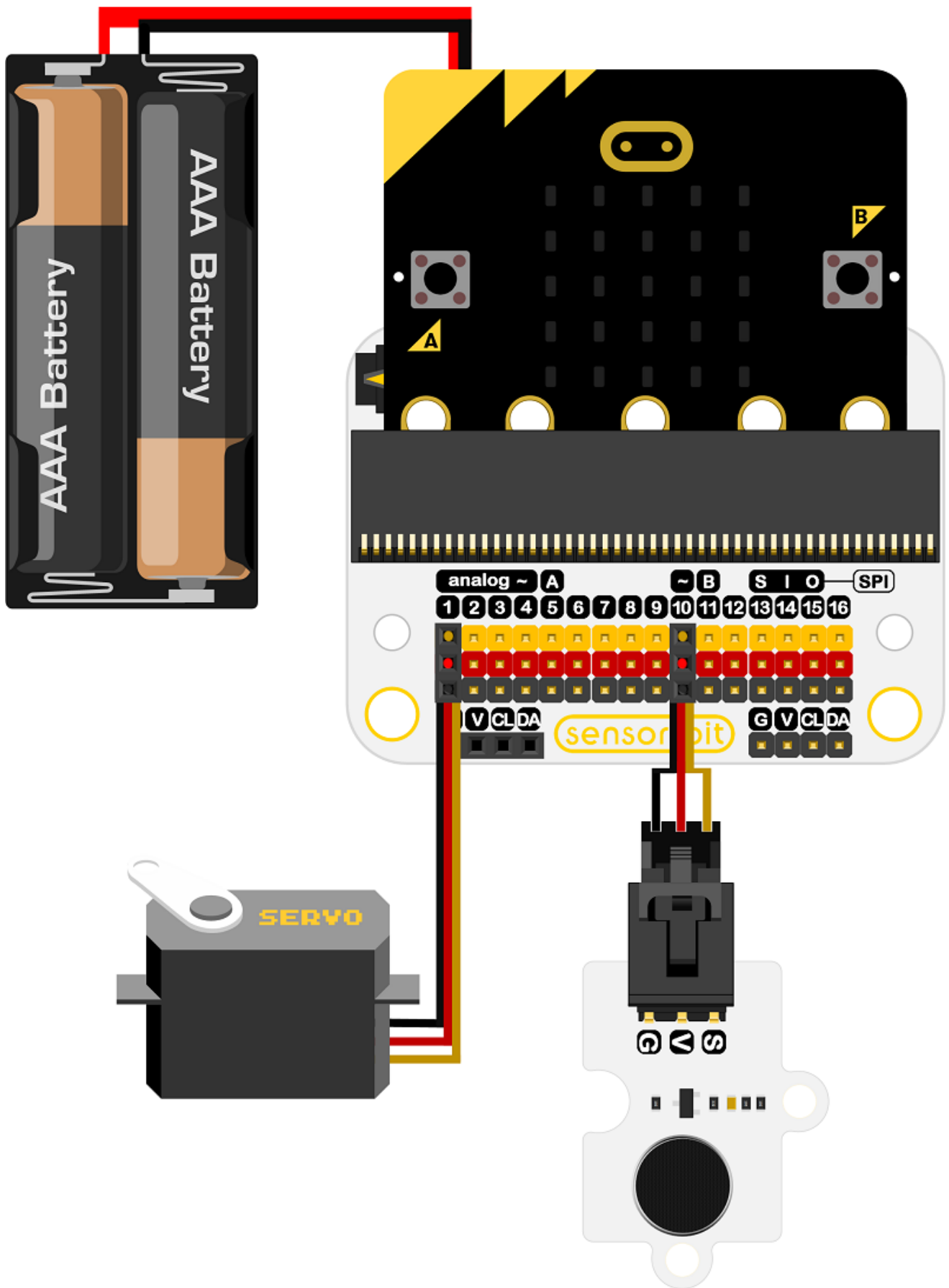


Paste devices as below picture:



## 6.5. Hardware connect

---



## 6.6. Software

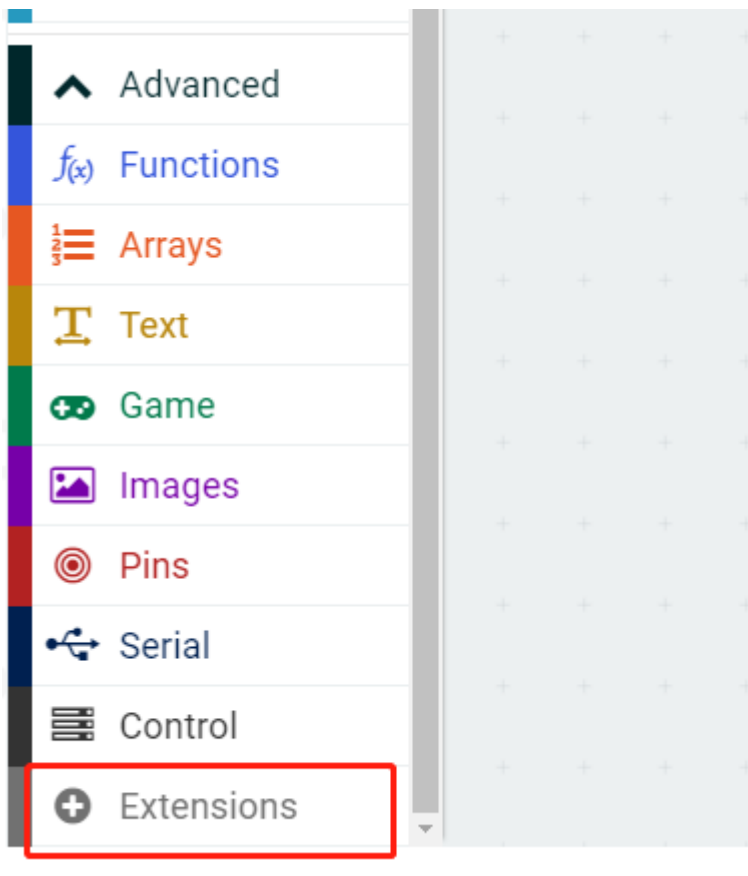
makecode

Edge Connector Data Sheet

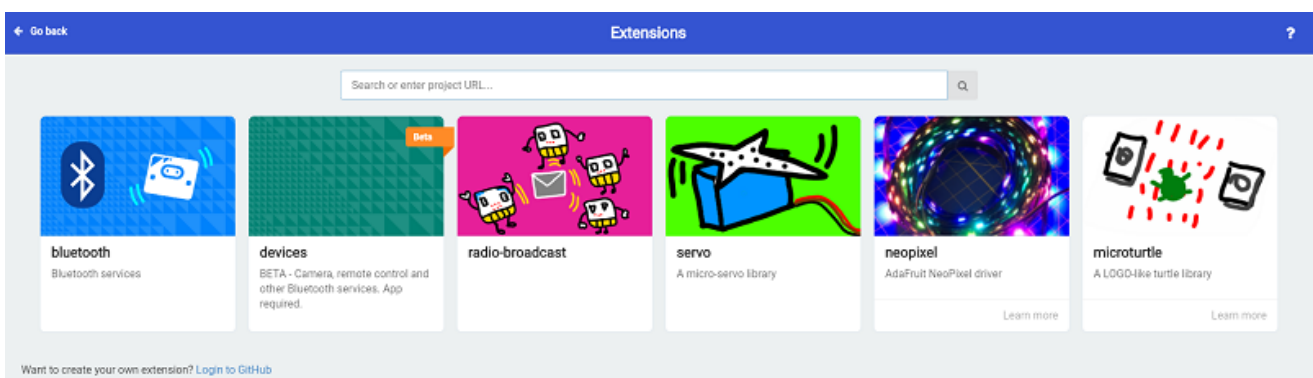
## 6.7. Programming

### Step 1

Go to MakeCode page, click Advanced in the code block and click on Extensions.



We need to add a new codebase for programming of smart home. Finding “Add Package” in the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in item menu bar.

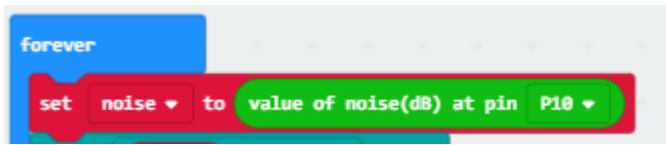
### Step 2

Drag on start on from Basic, snap into servo write pin, set P1 to 0.



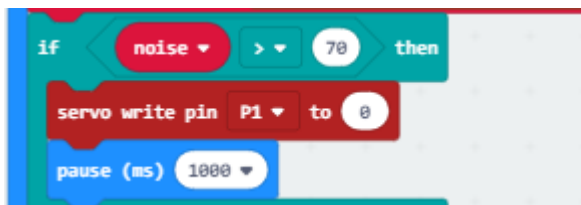
### Step 3

Snap set item to into forever, assignment value of noise to noise variables.



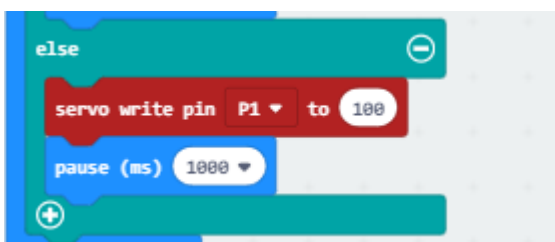
### Step 4

If value of noise > 70dB, snap into servo write pin,set P1 to 0 and the window be closed.



### Step 5

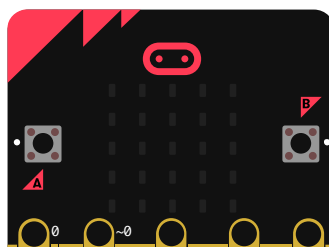
If value of noise < 70dB, snap into servo write pin,set P1 to 100 and the window be opened.

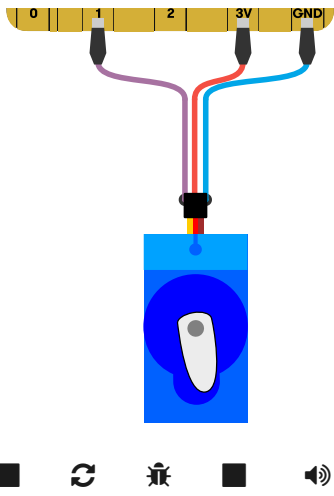


## Programming

Make code: [https://makecode.microbit.org/\\_Trh6x75hYcAT](https://makecode.microbit.org/_Trh6x75hYcAT)

You also could directly download program visit website as below:





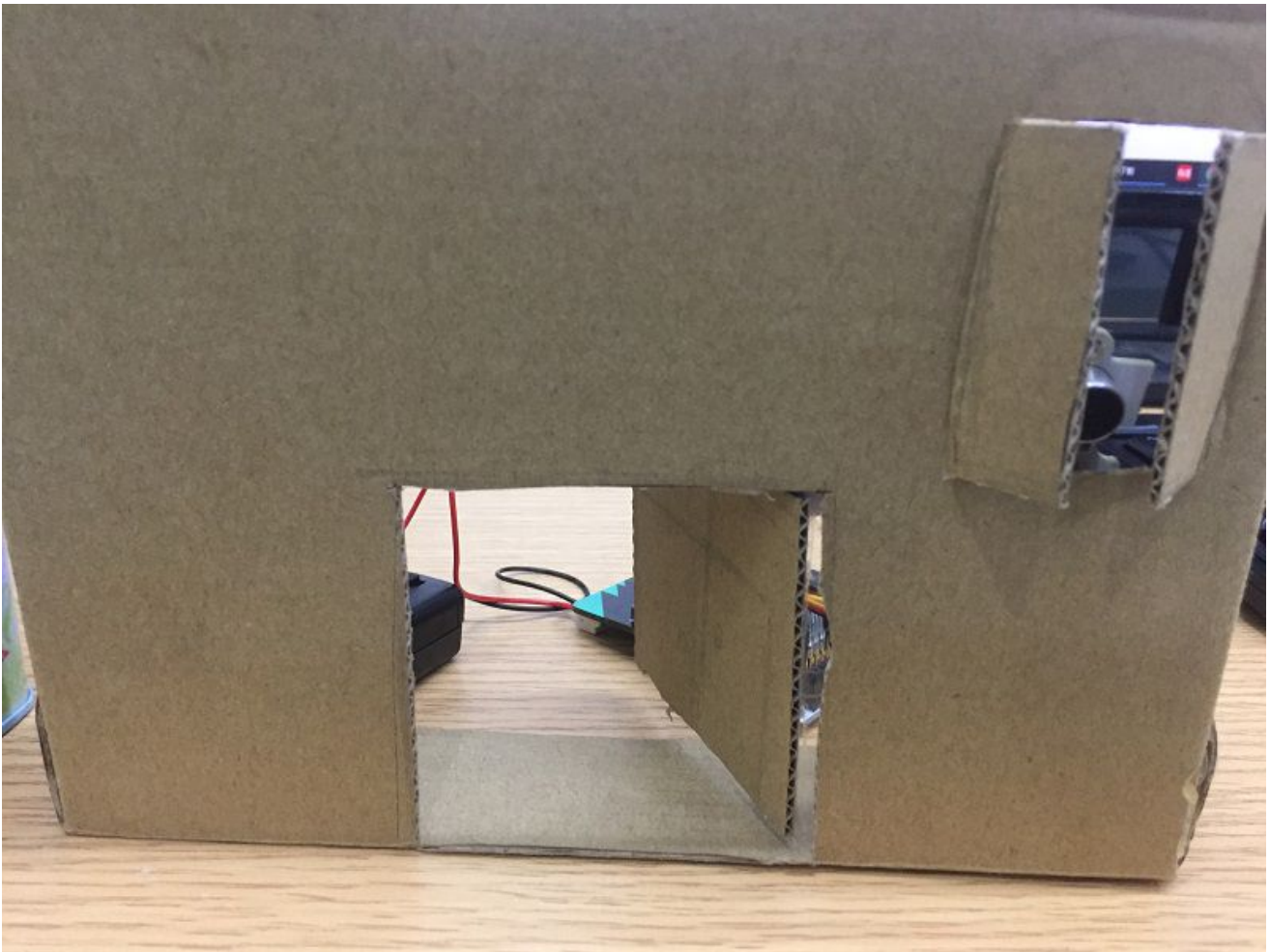
---

## 6.8. Result

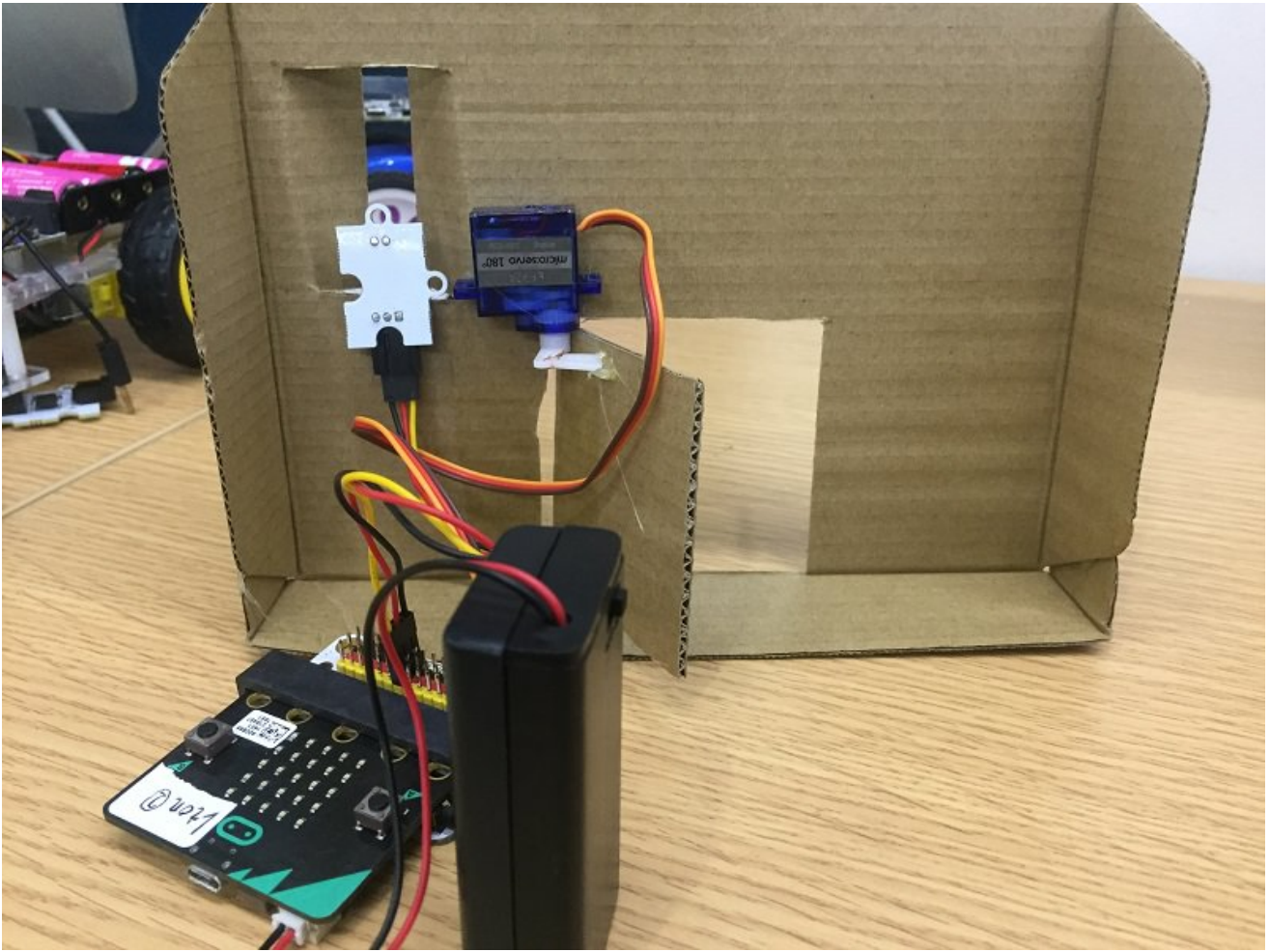
---

micro:bit driving servo open the window when value of noise > 70dB.

Front side:



Back side:



## 6.9. Think

---

How to know wether open the window on room temperature.

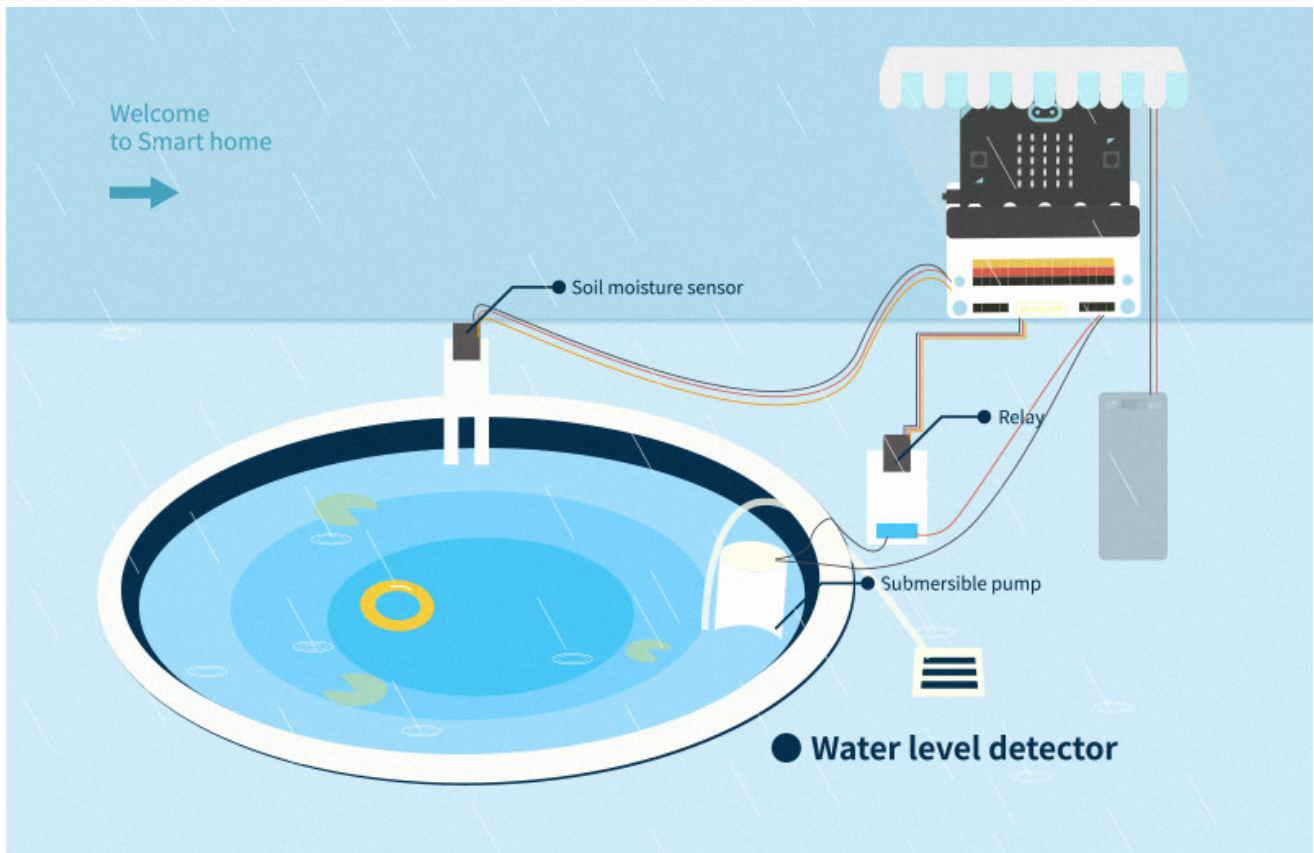
## 6.10. Questions

---

## 6.11. More information

---

## 7. case 05 Water Level Alarming



### 7.1. Goal

- Make a water level alarming.

### 7.2. Materials

- 1 x Smart home Kit]
- 1 x tank

### 7.3. Background

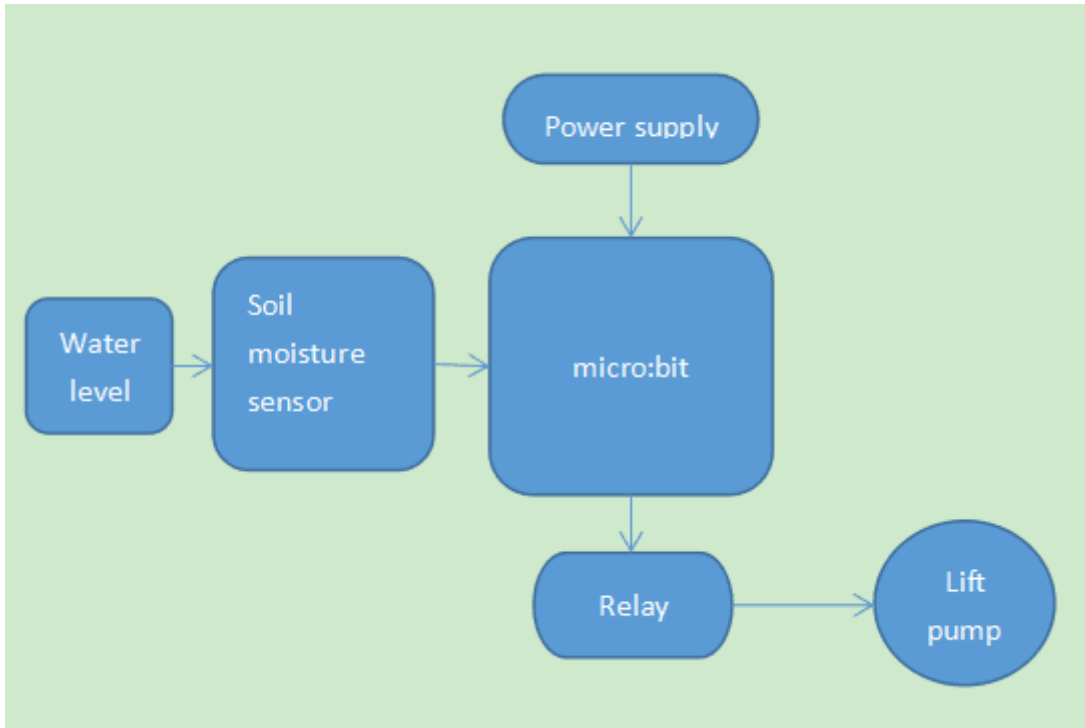
#### What is water level alarming



- We can't live without water, but much water will cause flood. Water level alarming can detect water level, micro:bit will received signals when the water level over security line and control lift pump to pumping.

## Water level alarming operation

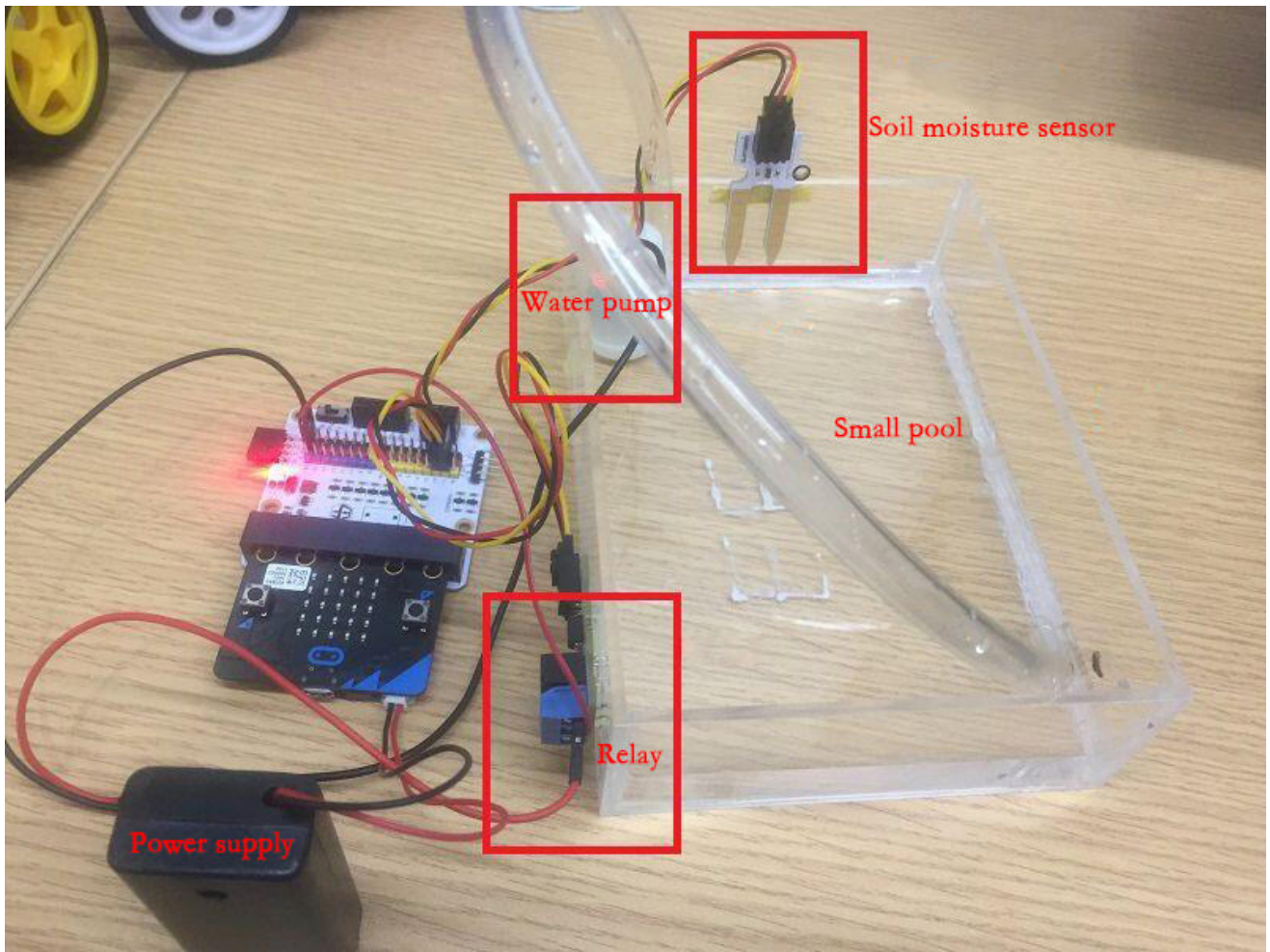
- When micro: bit received signal of soil moisture sensor,relay will drive and supply power to lift pump for pumping redundant water.



## 7.4. Practical operation

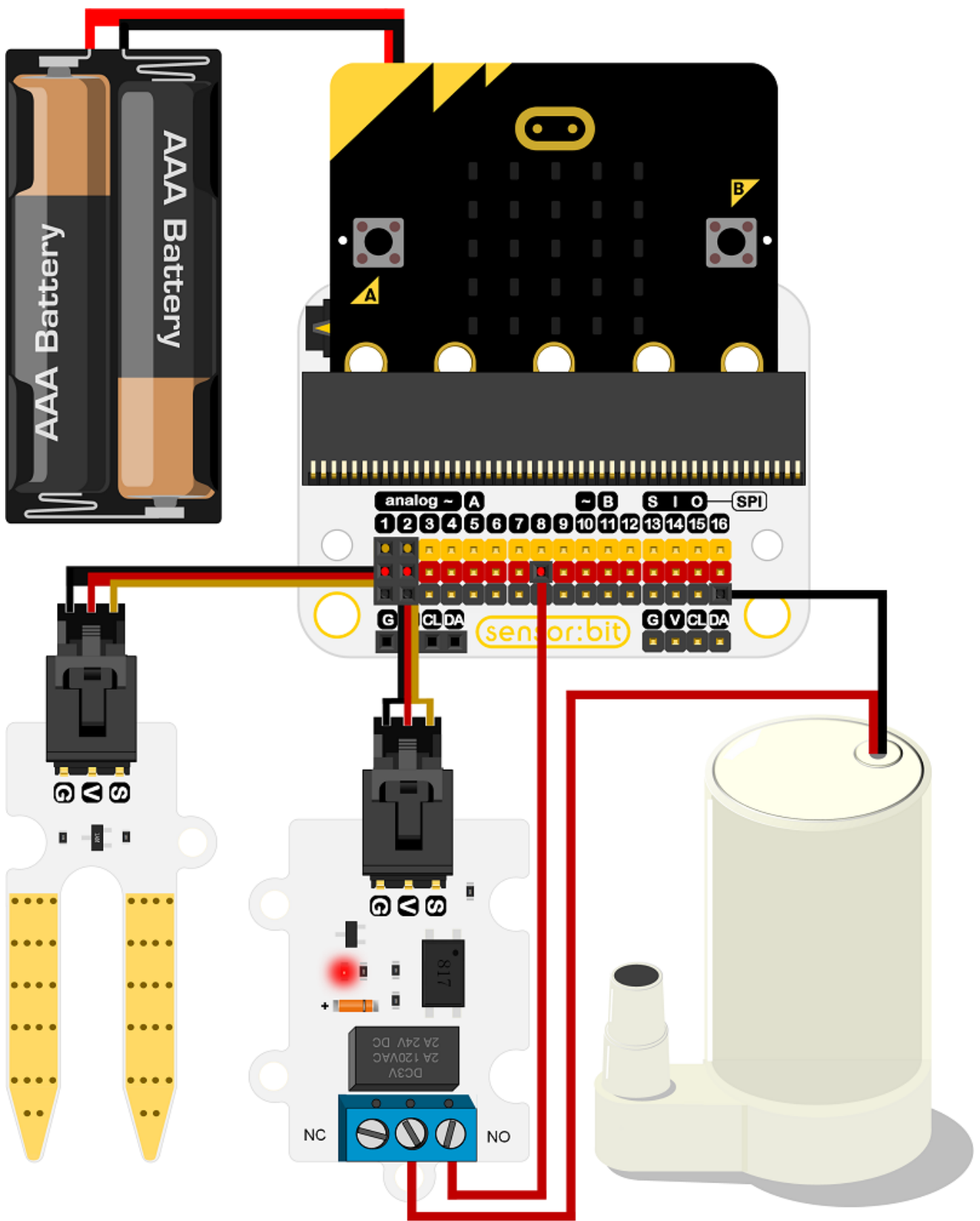
---

Preparing a tank and paste devices as below picture:



## 7.5. Hardware connect

---



## 7.6. Software

---

makecode

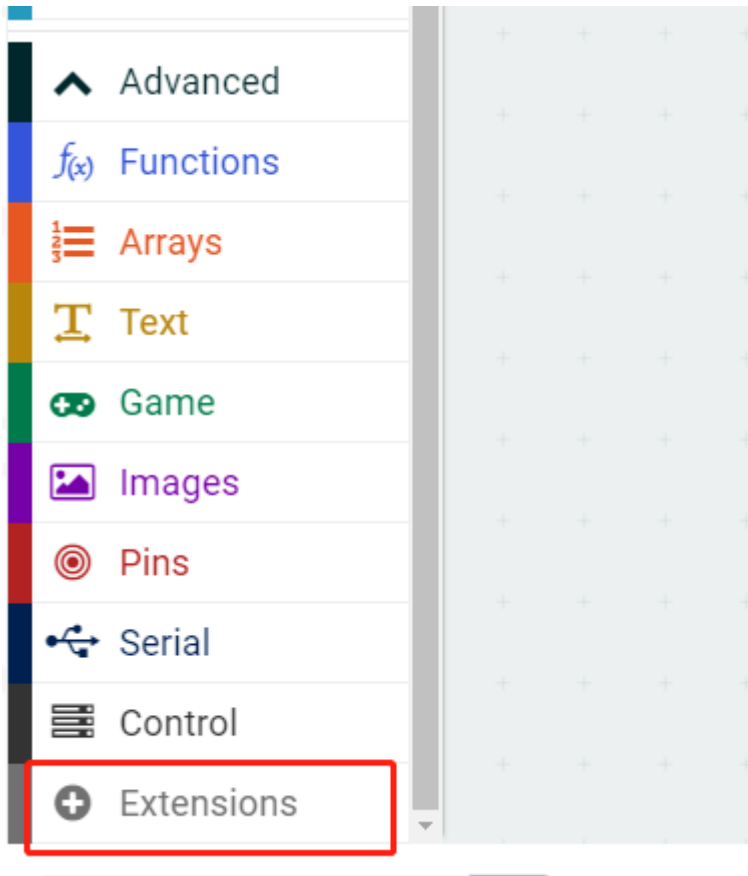
Edge Connector Data Sheet

## 7.7. Programming

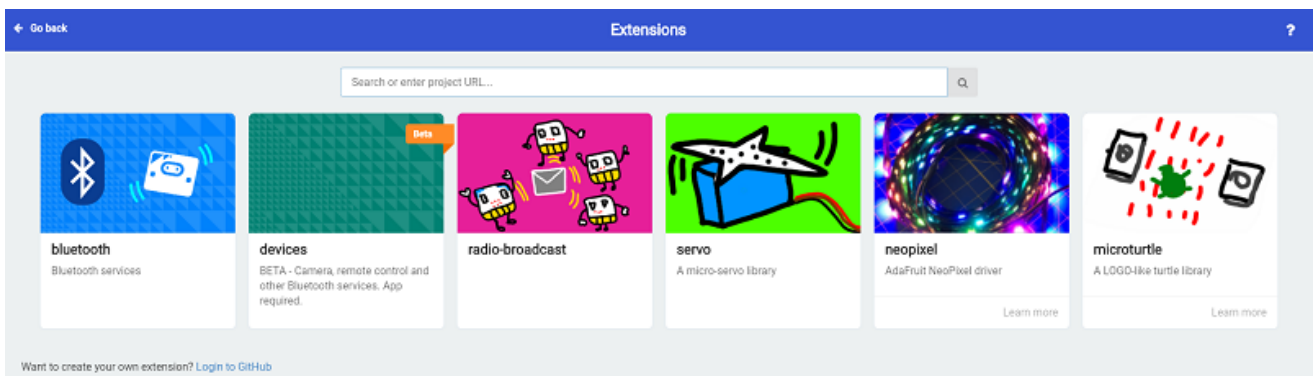
---

## Step 1

Go to MakeCode page, click Advanced in the code block and click on Extensions.



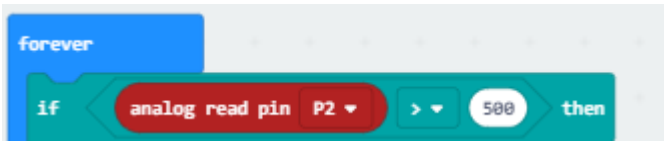
We need to add a new codebase for programming of smart home. Finding “Add Package” in the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in item menu bar.

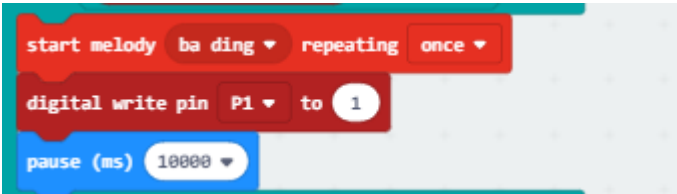
## Step 2

Snap if statement into forever, set analog read pin P2 > 500, that's say when P2 > 500, the water level is higher than security line.



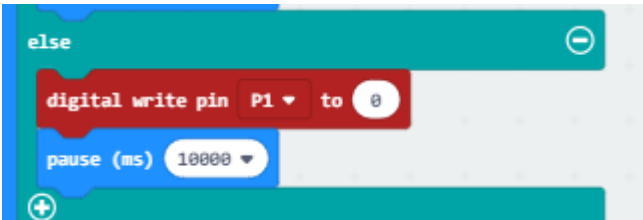
### Step 3

Set start melody “ba ding” repeating once as alarming voice, set digital write pin P1 to 1 as driving the pumping.



### Step 4

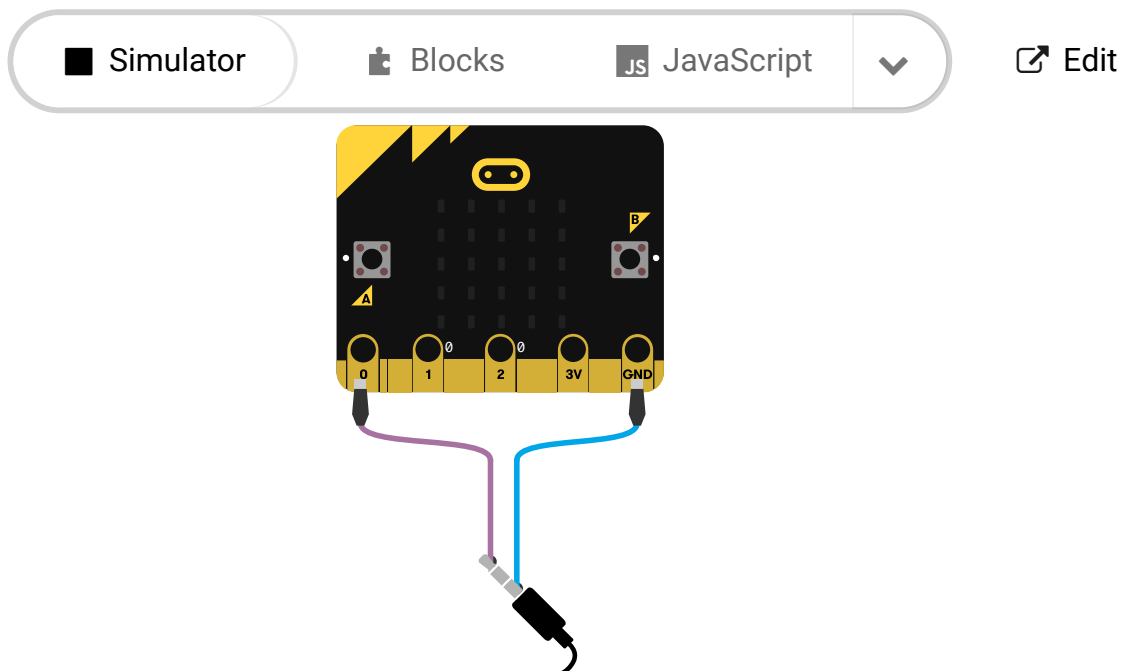
Else, set digital write pin P1 to 0 as turning off the pump.



## Programming

Make code: [https://makecode.microbit.org/\\_9KqHhp1J45ho](https://makecode.microbit.org/_9KqHhp1J45ho)

You also could directly download program visit website as below:



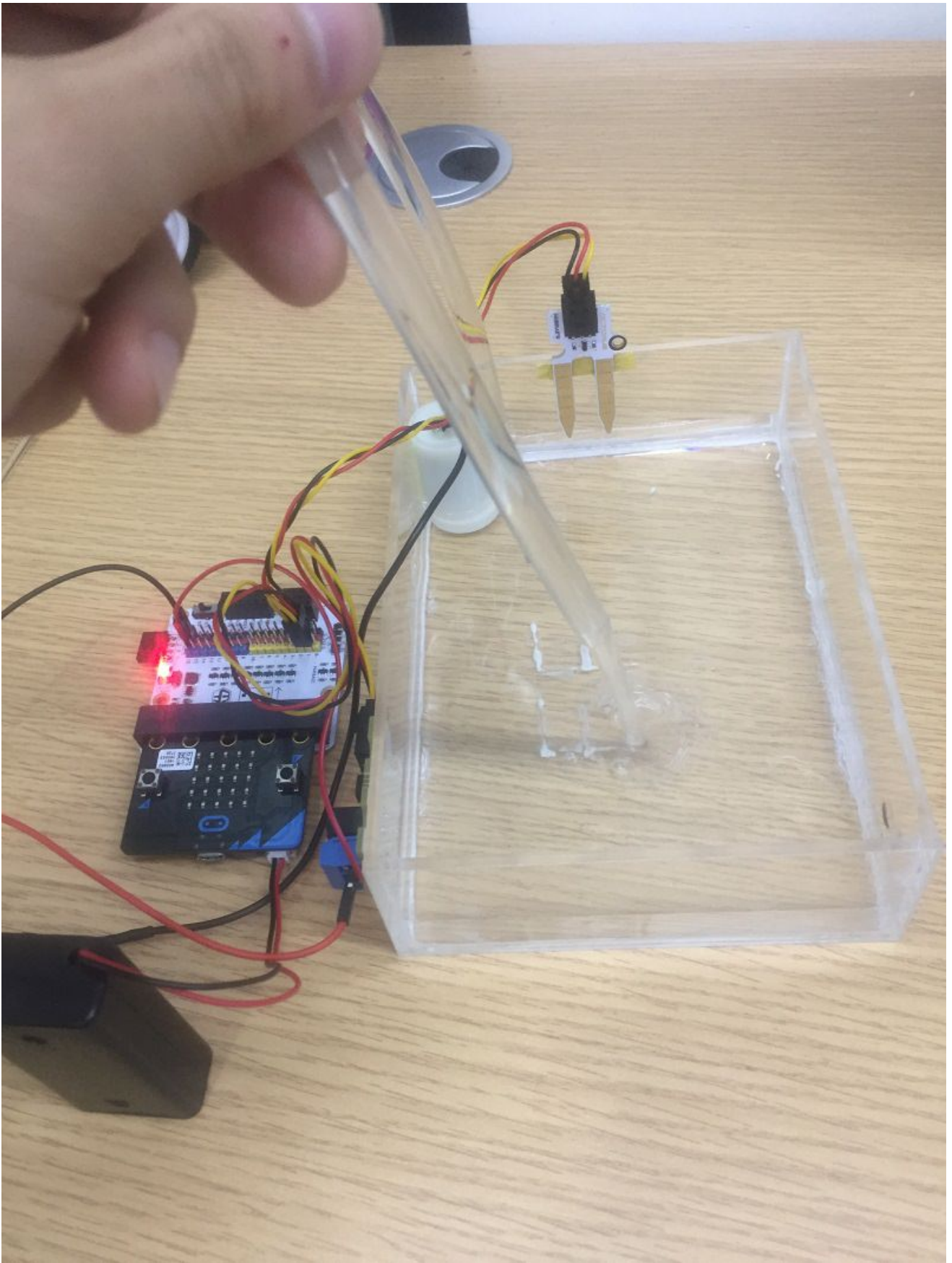
---

## 7.8. Result

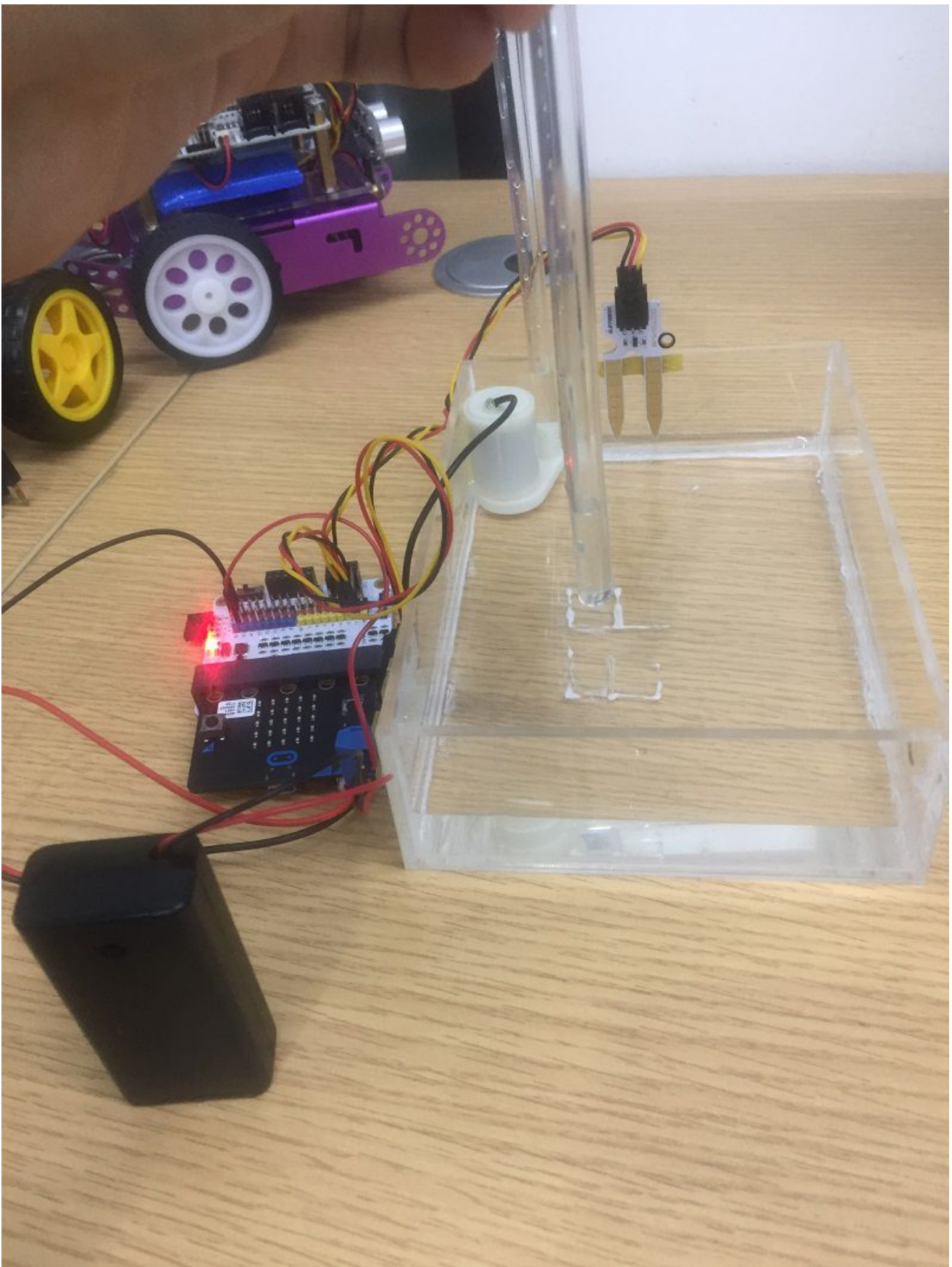
---

When the water level over security line,micro:bit will control lift pump to pumping.

Pumping:



Stop pumping:



## 7.9. Think

---

How to use micro:bit control water level in fish tank ?

## 7.10. Questions

---



## 7.11. More information

---

## 8. case 06 smart telecontrol door opener

### 8.1. Goal

---

- Make a smart telecontrol door opener.

### 8.2. Materials

---

- 1 X Smart Home Kit
- 1 X scissors
- 1 X glue
- 1 X white paper,
- 1 X cardboard



### 8.3. Background

---

- The analog noise sensor E-Blocks can sense the outside noise signal. It is also can be used to detect human voice.

**What is a “smart telecontrol door opener”.**

- Your friends are coming, but you are busy with your own business, or watching highlights of a television program or playing a very interesting computer game. You have no time to open the door. Here, you can make a smart telecontrol door opener.

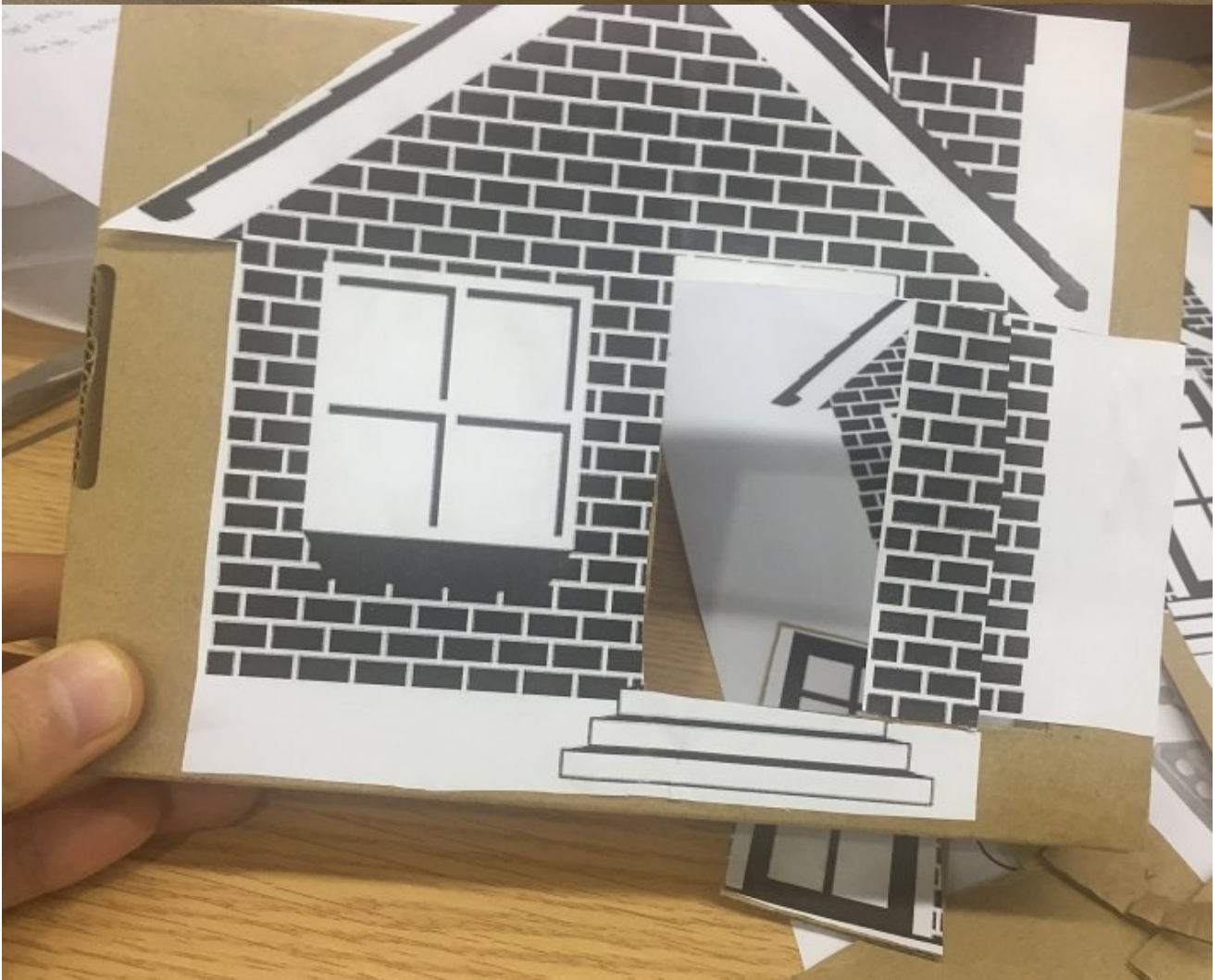
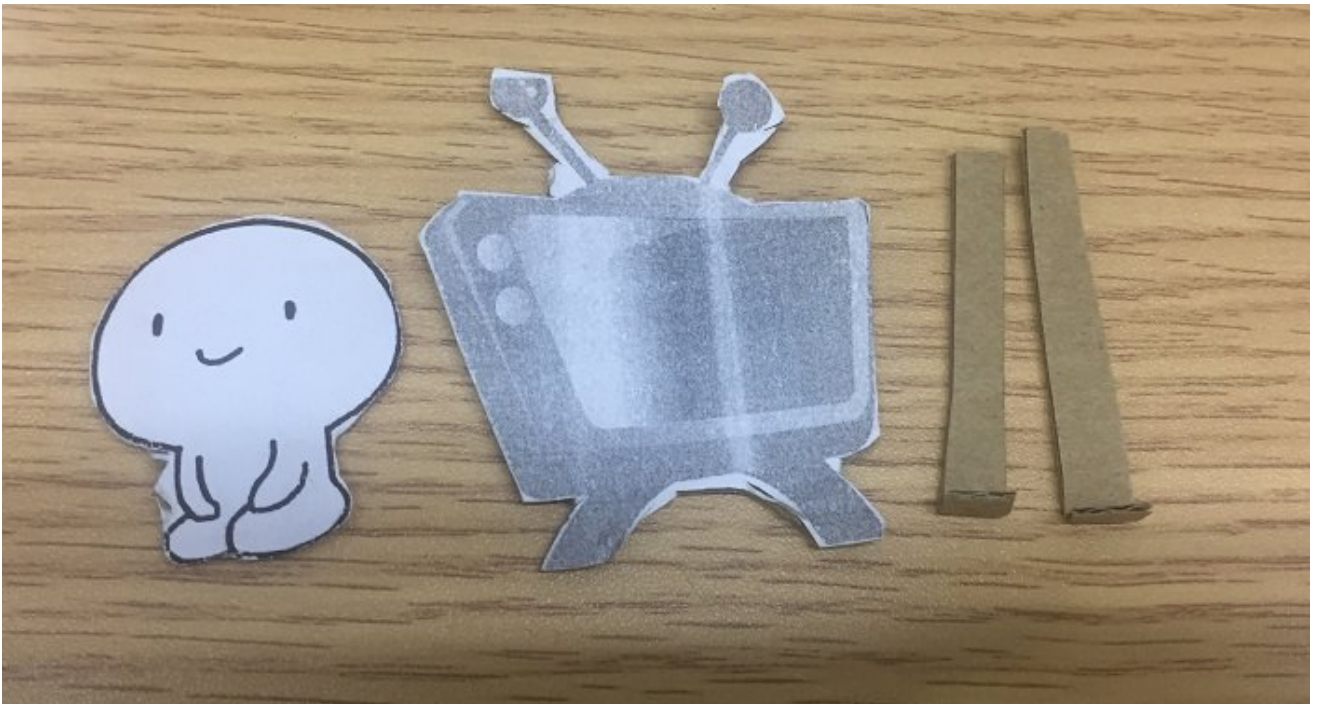
## **Principle of an analog noise sensor**

- When the analog noise sensor is detecting the human signal, it will remind you by OLED screen and you can press the button and let the door open.

## **8.4. Practical operation**

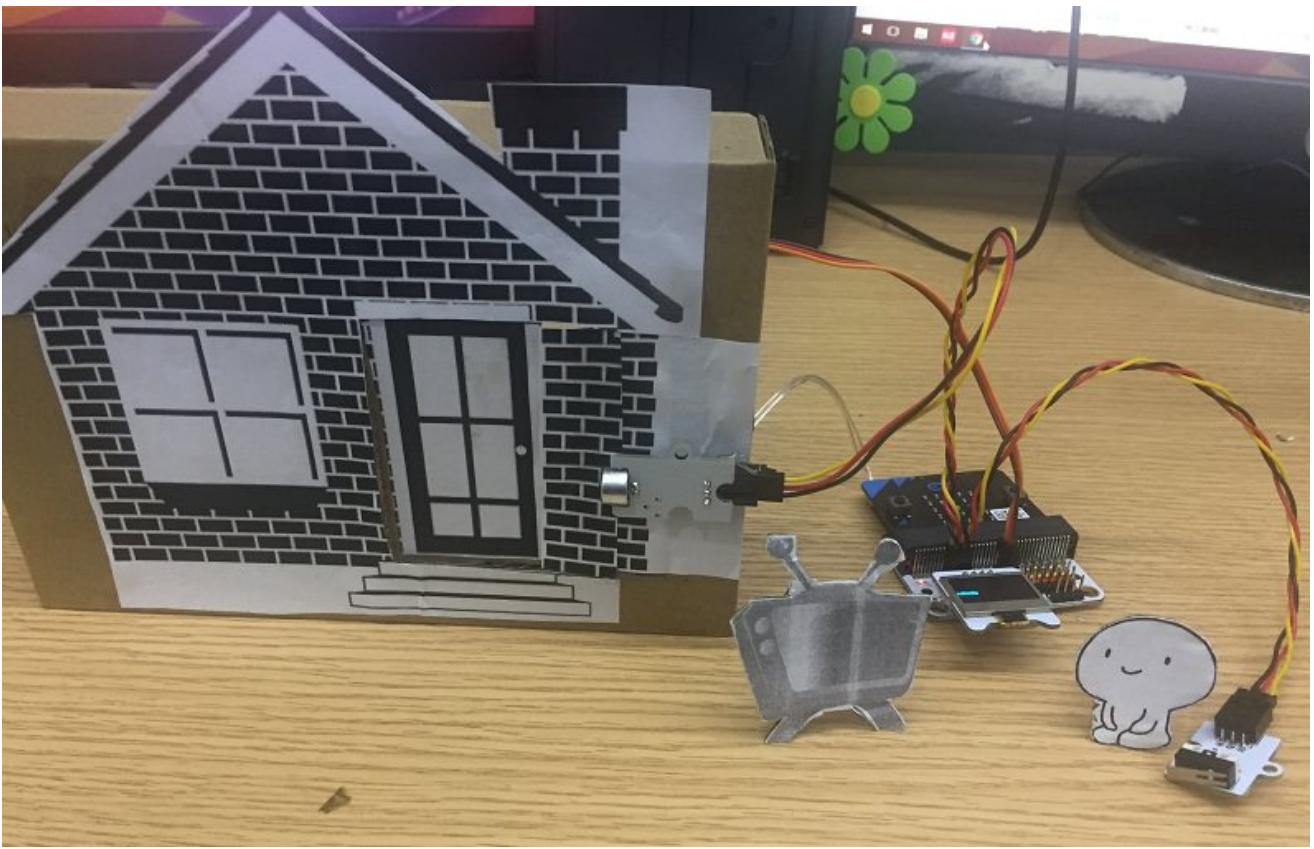
---

- Prepare a scissors, a bottle of glue and a piece of cardboard.
- Stick the paper you prepared on the cardboard and clip it as you need.

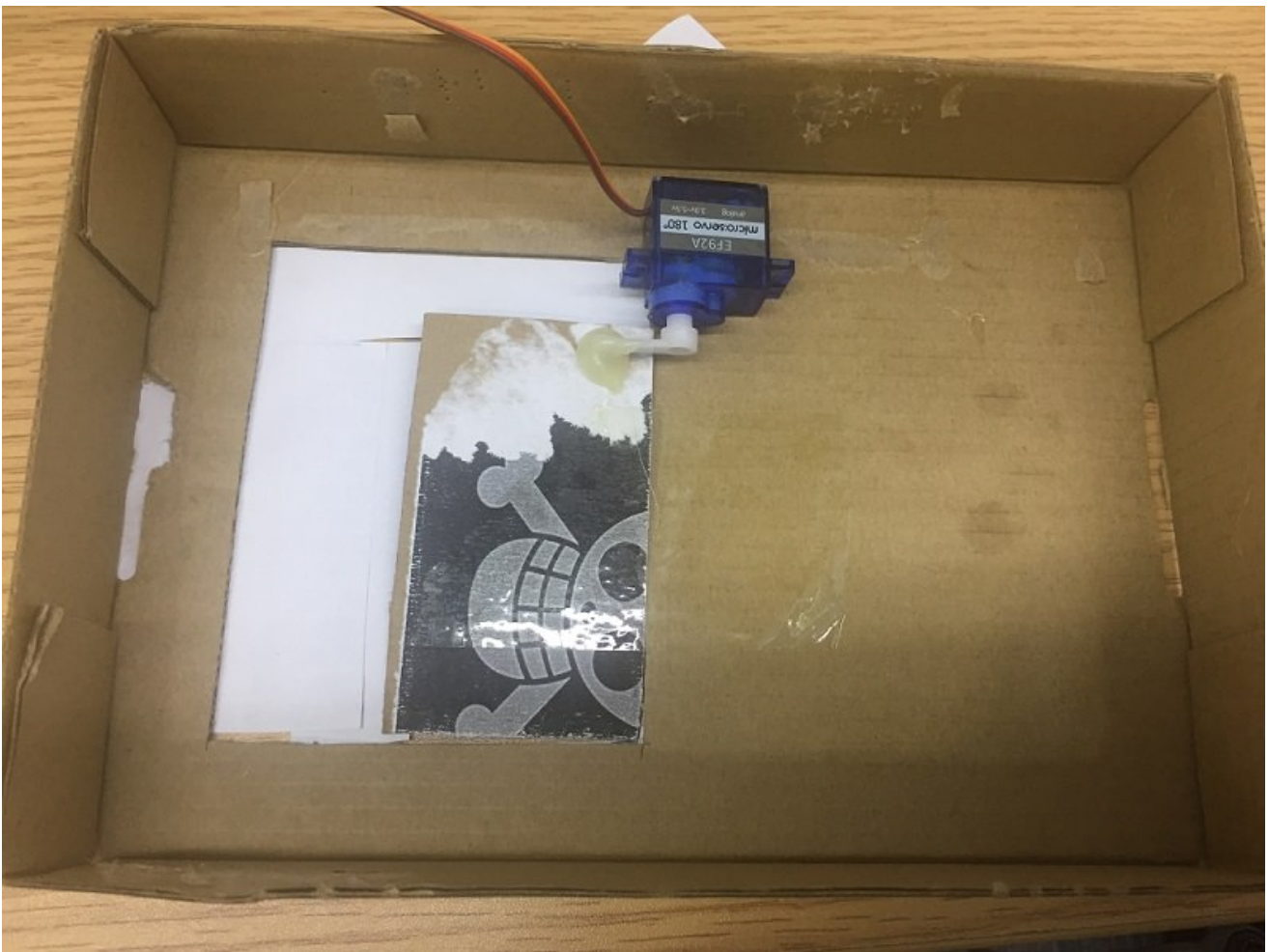


- Set up as below:

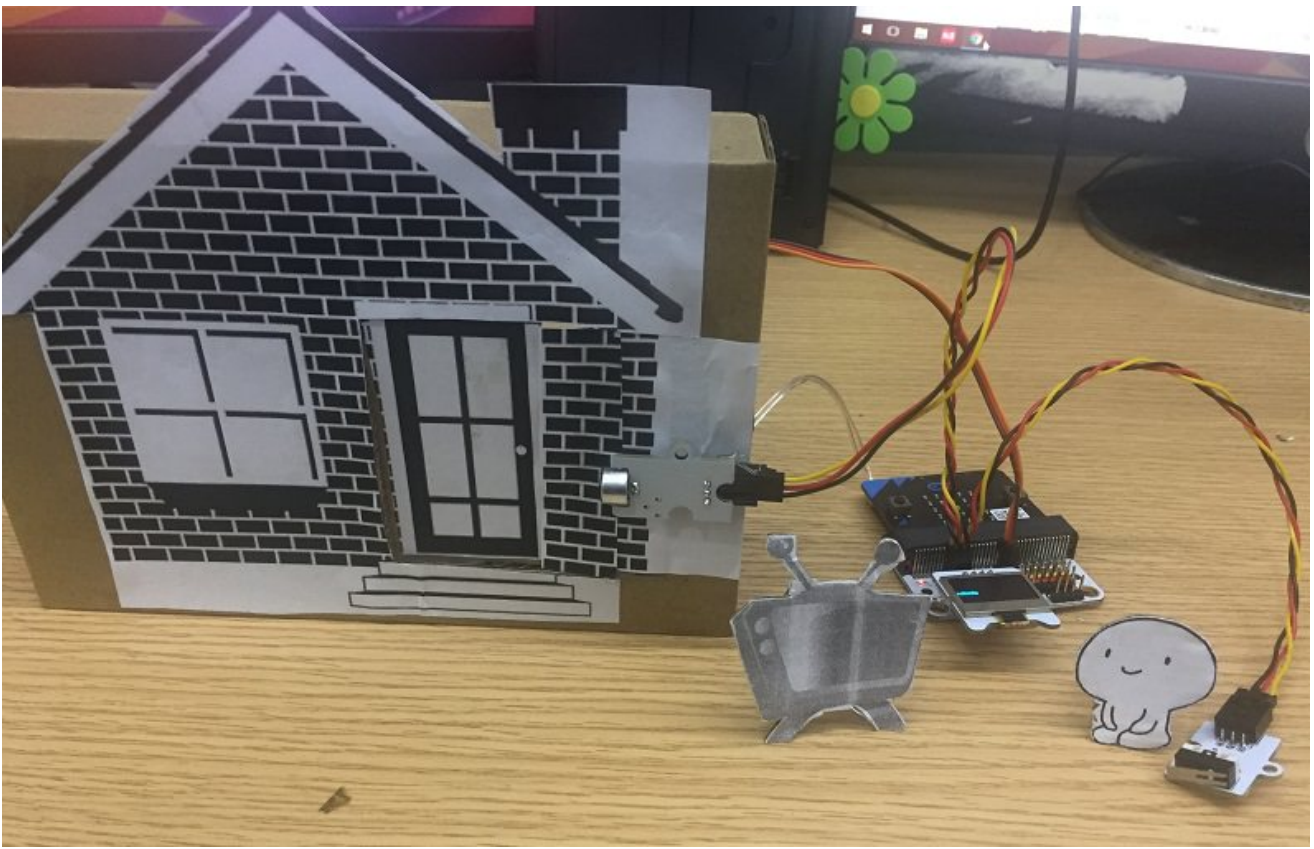
The front side:



The back side:



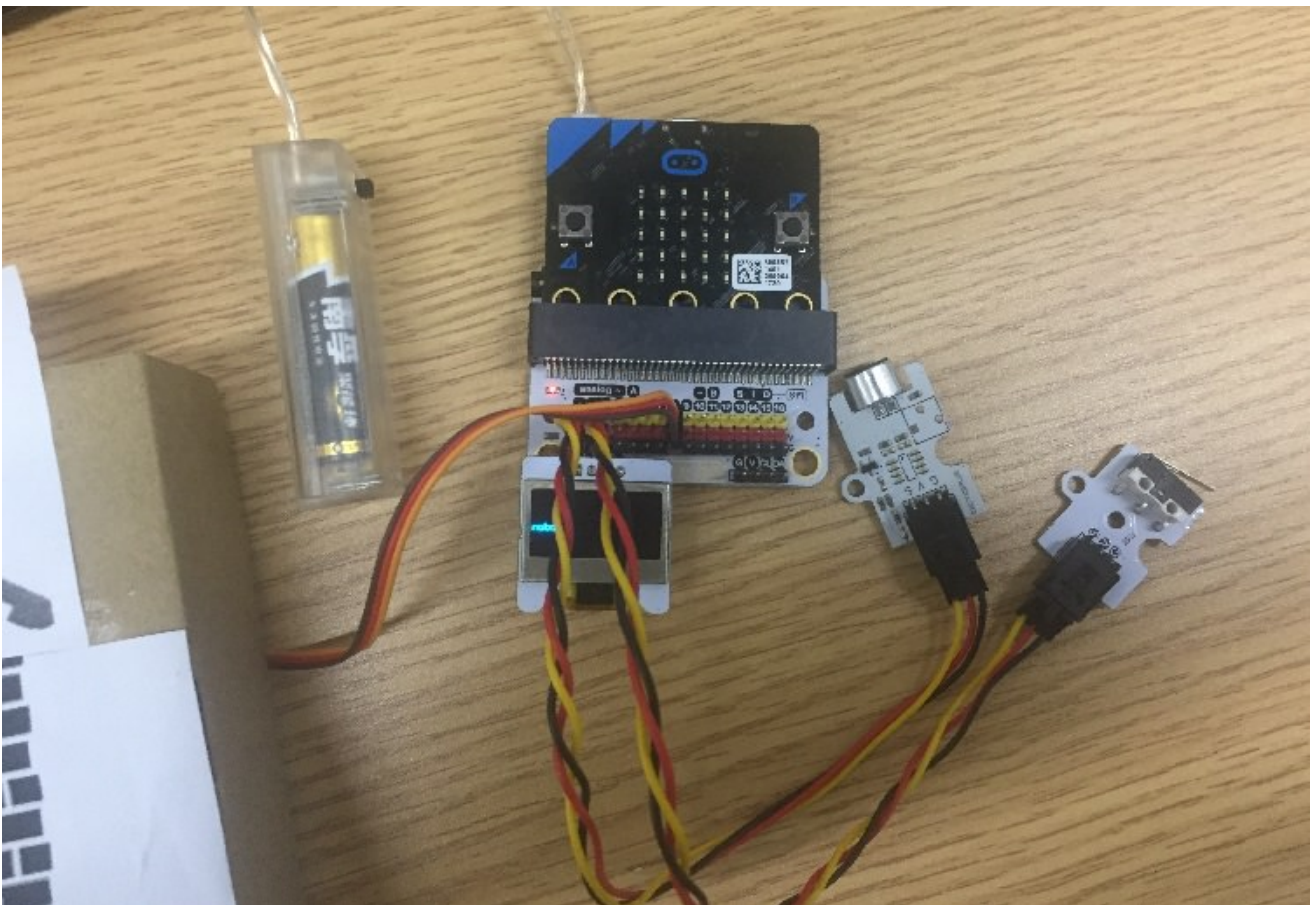
Set and stick components as below:



## 8.5. Hardware Connect

---

Connect the analog noise sensor to the P1 port of the expansion board. Connect the crash sensor to the P2 port of the expansion board. Conenct the 180 deg servo to the P8 port of the expansion board. Connect the micro:bit to the batteries pack.



## 8.6. Software

---

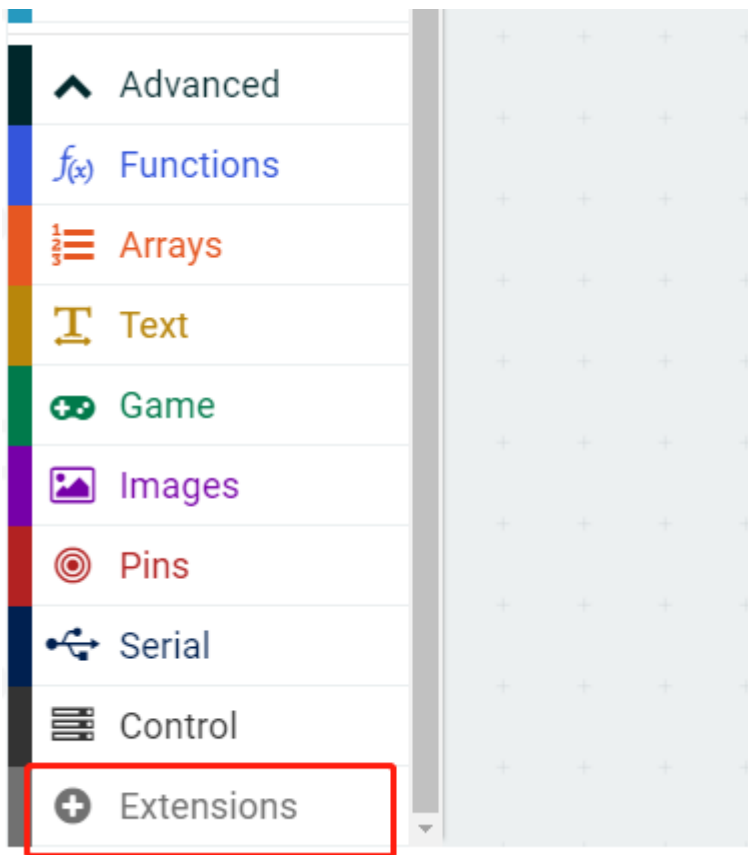
makecode

## 8.7. Programming

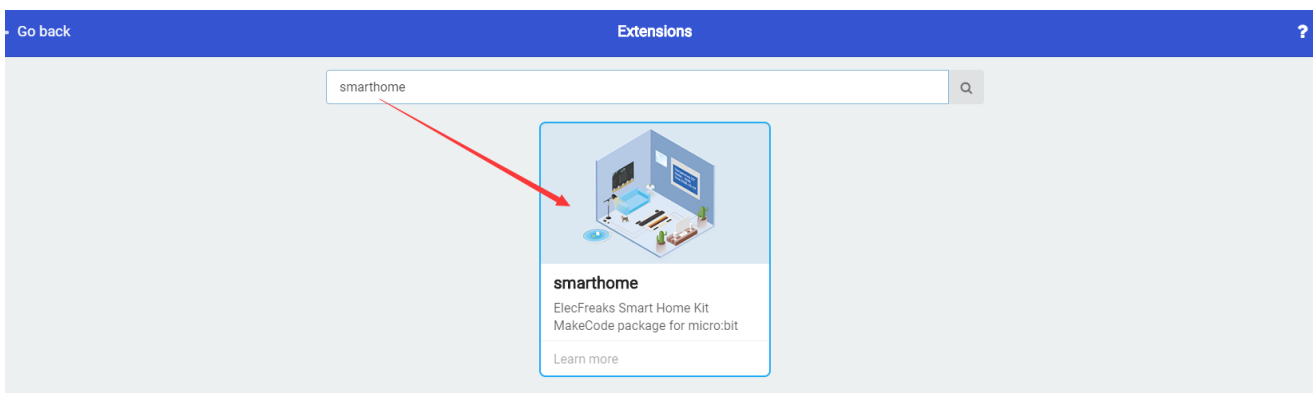
---

### Step 1

- Click “Advanced” in the makecode code drawer for more codes.



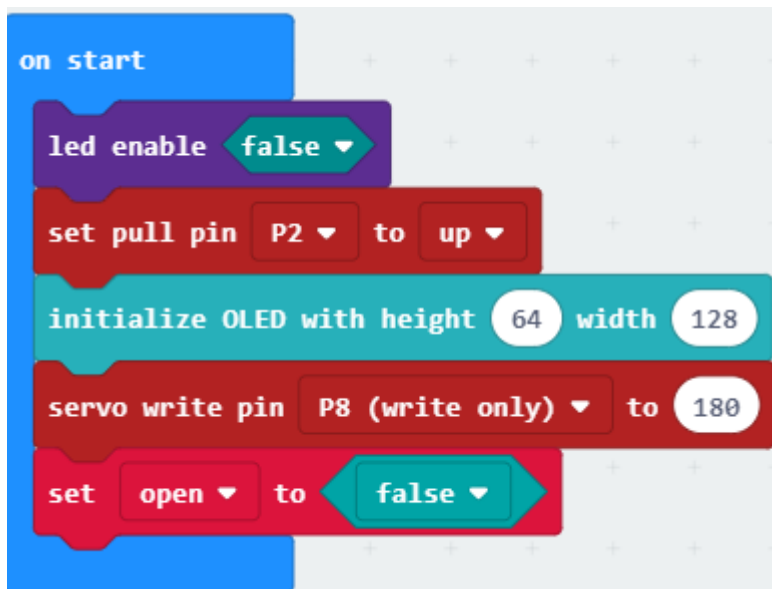
- We need to add a new codebase for programming of smart home. Finding “Extensions” at the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in the item menu bar.

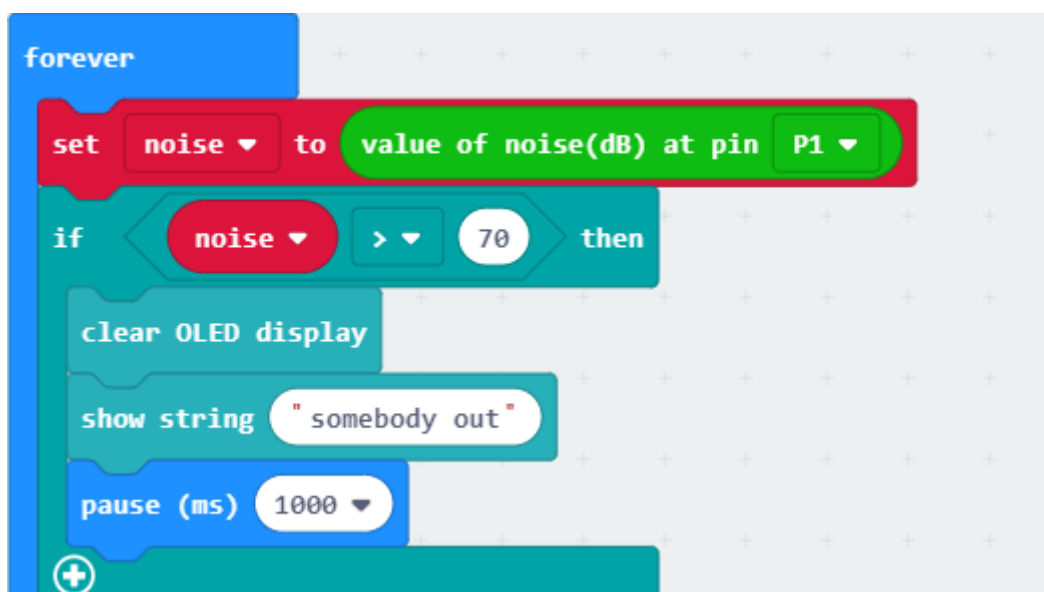
## Step 2

Snap the on start block from the Basic, then snap the led enable block into the on start, set it to "false". It is to close the LED display of the micro:bit. Click on the "Advanced", choose the Pins and click the more. Snap the set pull pin block and set the P2 port to high level for providing an stable voltage. Initialize the OLED. Snap into the servo write block. Set P8 to 180, it is to set initial state of the servo to close the door. At last, set the variable to open and set its initialization value to false for not open the door.



## Step 3

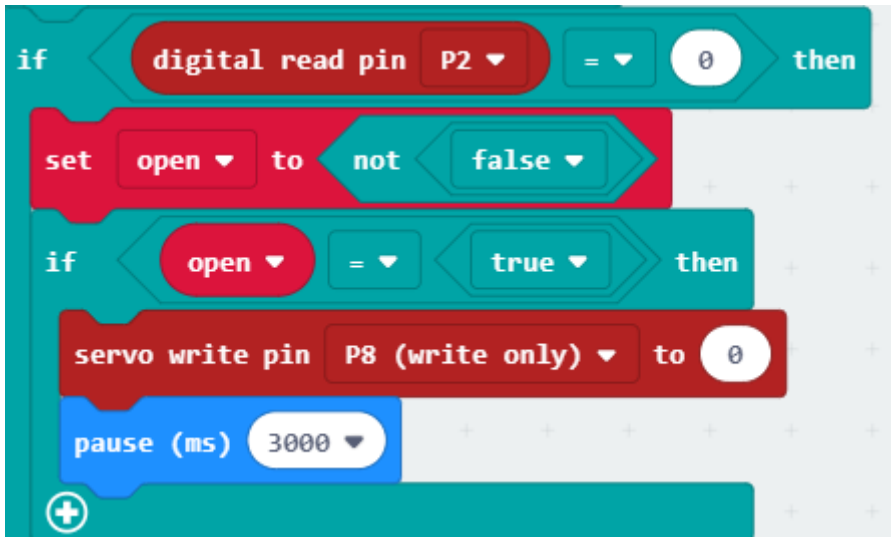
Initialize the variable noise to save the received noise value. Under the forever loop, transmit the noise value of the P1 port to the noise variable. If the noise value is greater than the 70db, it means someone is knocking the door and the OLED is showing "somebody out". Snap the clear OLED display block and the show string block to display message.





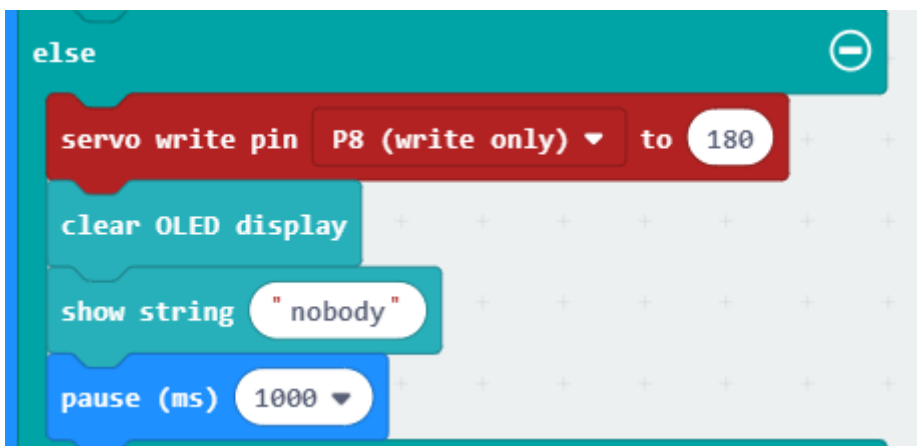
## Step 4

To judge the value of the crash sensor, using the digital read block to read the value of the crash sensor. That is the value of the P2 port. Set the value of the pin P2 to 0, and set the open variable to doors open. That is “set open to not false”. Set the variable open to “true” and snap the servo write pin block, then set the value of the P8 port to 0. “pause(ms) 3000”, which means the opening time is 3 seconds.



## Step 5

Else, set the servo write pin P8 to 180 and show string “nobody”, which means it is not need to open the door.

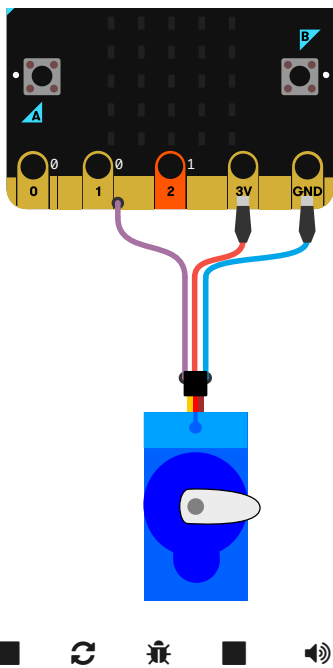


## Program

Program link: [https://makecode.microbit.org/\\_htqEPX30qYKL](https://makecode.microbit.org/_htqEPX30qYKL)

You also could directly download program by visiting website as below:



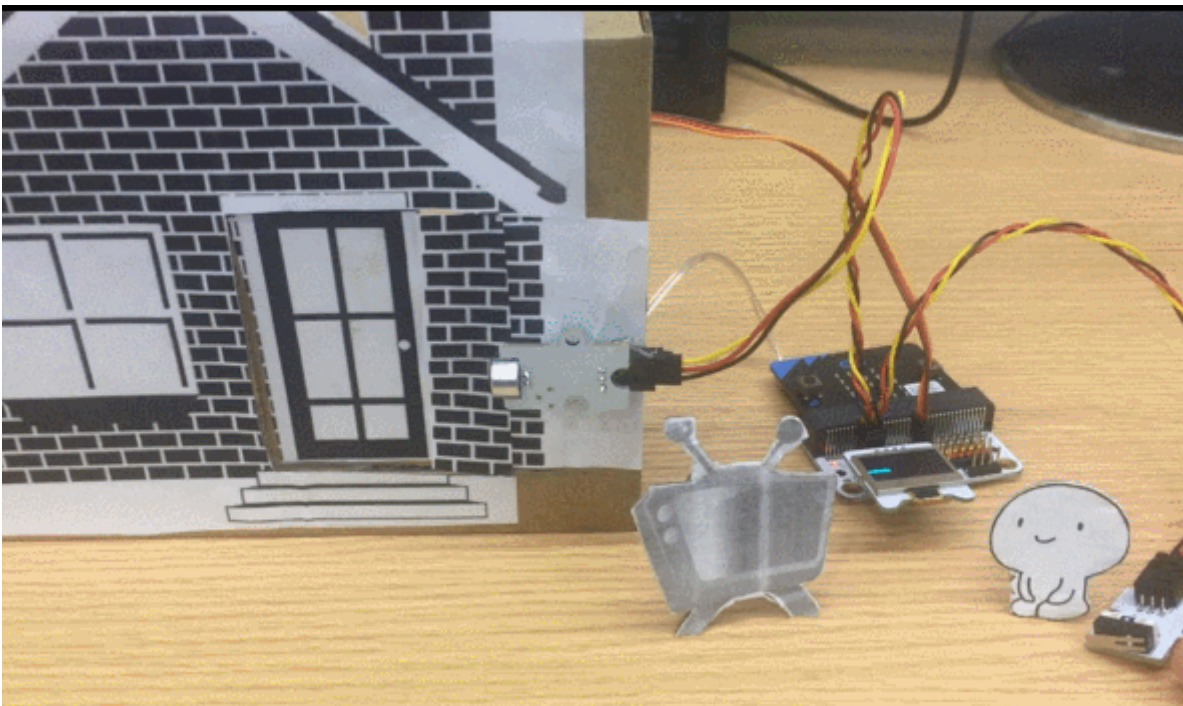


---

## 8.8. Result

---

- When it is detecting the people signal, the OLED screen will show “somebody out”.
- Press the button, the door will open, after 3 seconds, the door will close.
- When it is not detecting the people signal, the OLED screen will show “Nobody”.



## 8.9. Think

---

- How can we use the micro:bit to control the fan automatically turn on and turn off.

## 8.10. Questions

---

## 8.11. More Information

---

## 9. case 07 smart decibel tester

### 9.1. Goal

---

- Make a smart decibel tester.

### 9.2. Materials

---

- 1 X Smart Home Kit
- 1 X scissors
- 1 X glue
- 1 X white paper
- 1 X cardboard

### 9.3. Background

---

- The analog noise sensor E-Blocks can sense the outside noise signal. It is also used to sense the intensity of the DB.
- The rainbow LED E-Blocks can change many colors. In this case, we are going to show 9 colors.

#### What is a “smart decibel tester”.

- The rainbow LED will change its light colors according to different voice db.

#### Principle of a smart decibel tester

- When the analog noise sensor is receiving human voice, it will send the signal to the micro:bit. The micro:bit will judge the voice intensity and the LED will show different light colors.

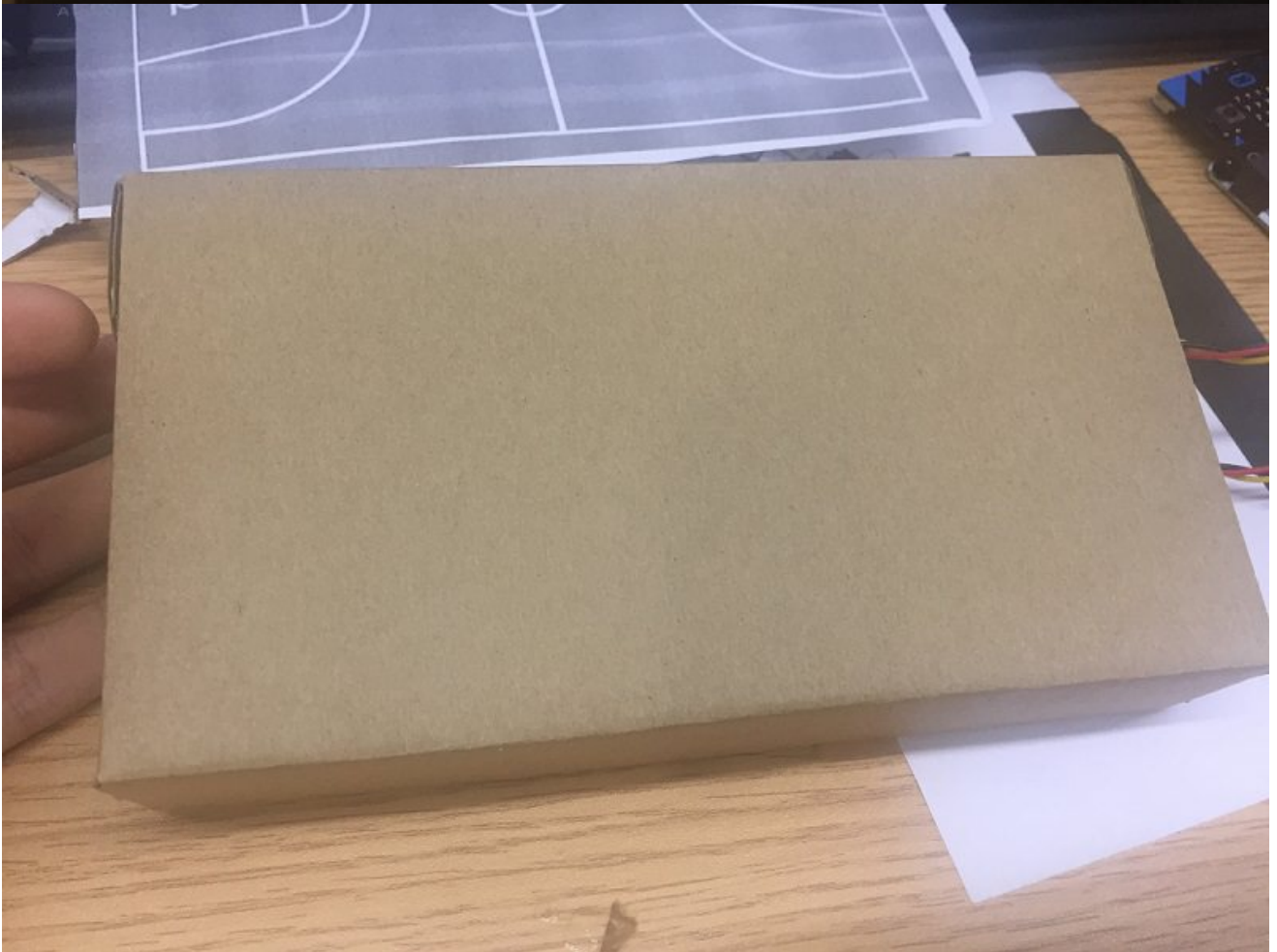
---

Colors | Parameters :-: | :-: Red|30db Orange|40db Yellow|50db Green|60db Blue|70db Indigo|80db Purplish blue|90db Purple|100db White|110db Blue|120db

## 9.4. Practical Operation

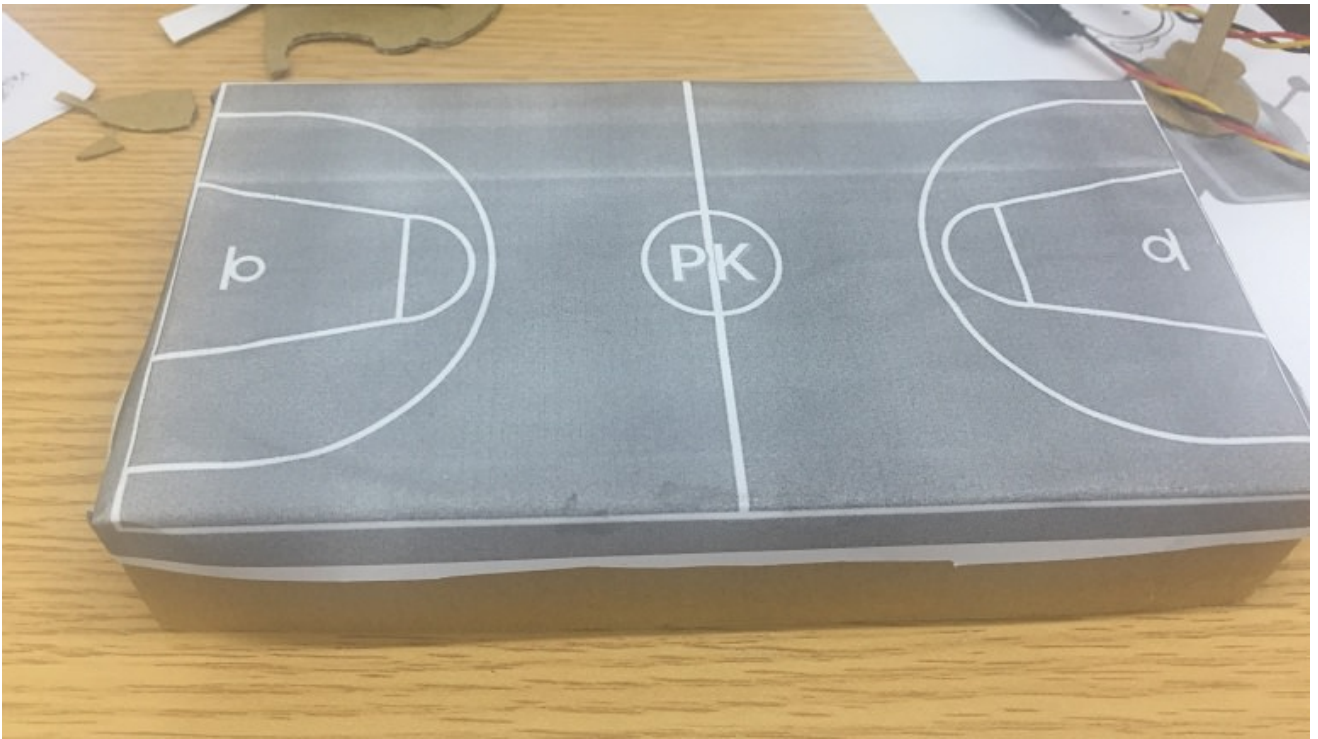
---

- Prepare a scissors, a bottle of glue and a piece of cardboard.
- Stick the paper you prepared on the cardboard and clip it as you need.



- Set up as below:

The front side:

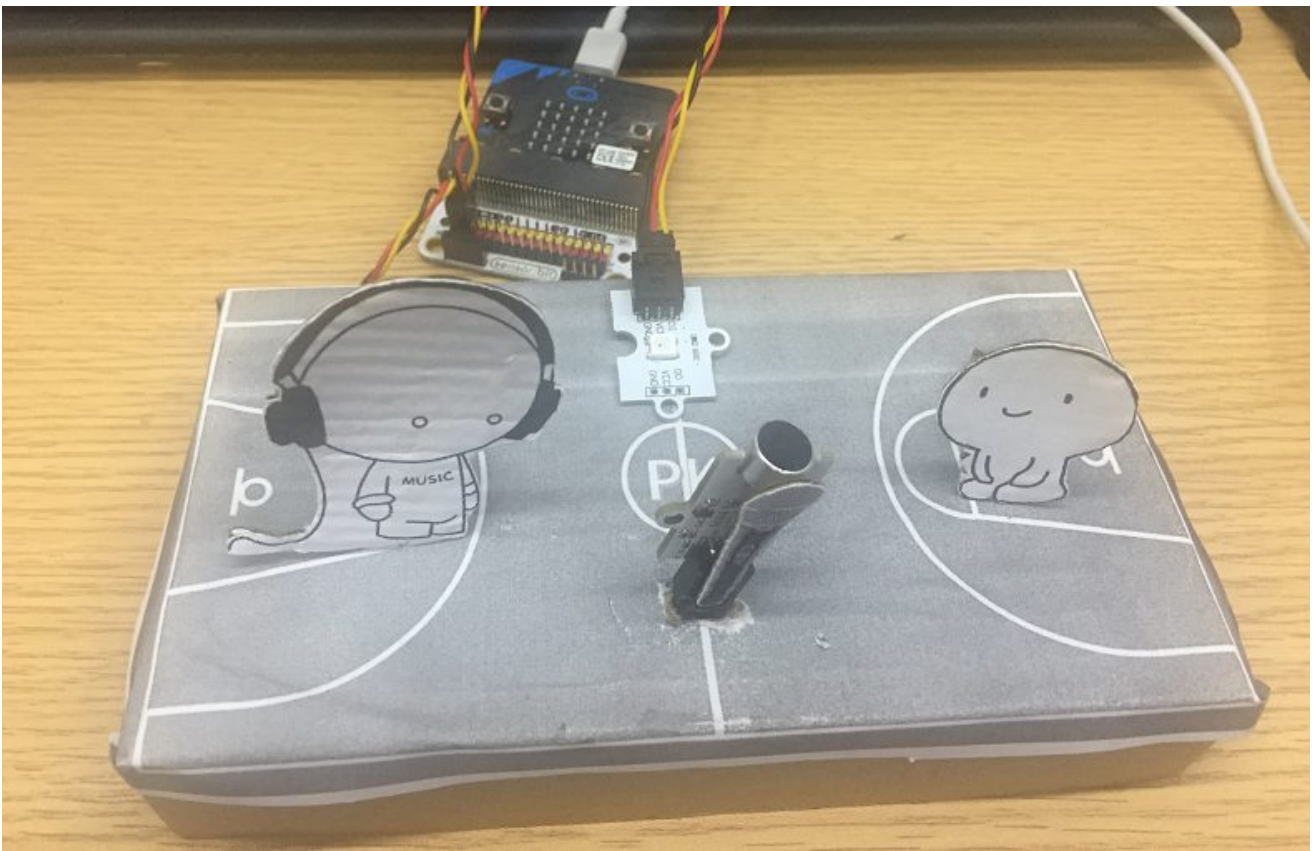


The back side:



Set and stick components as below:

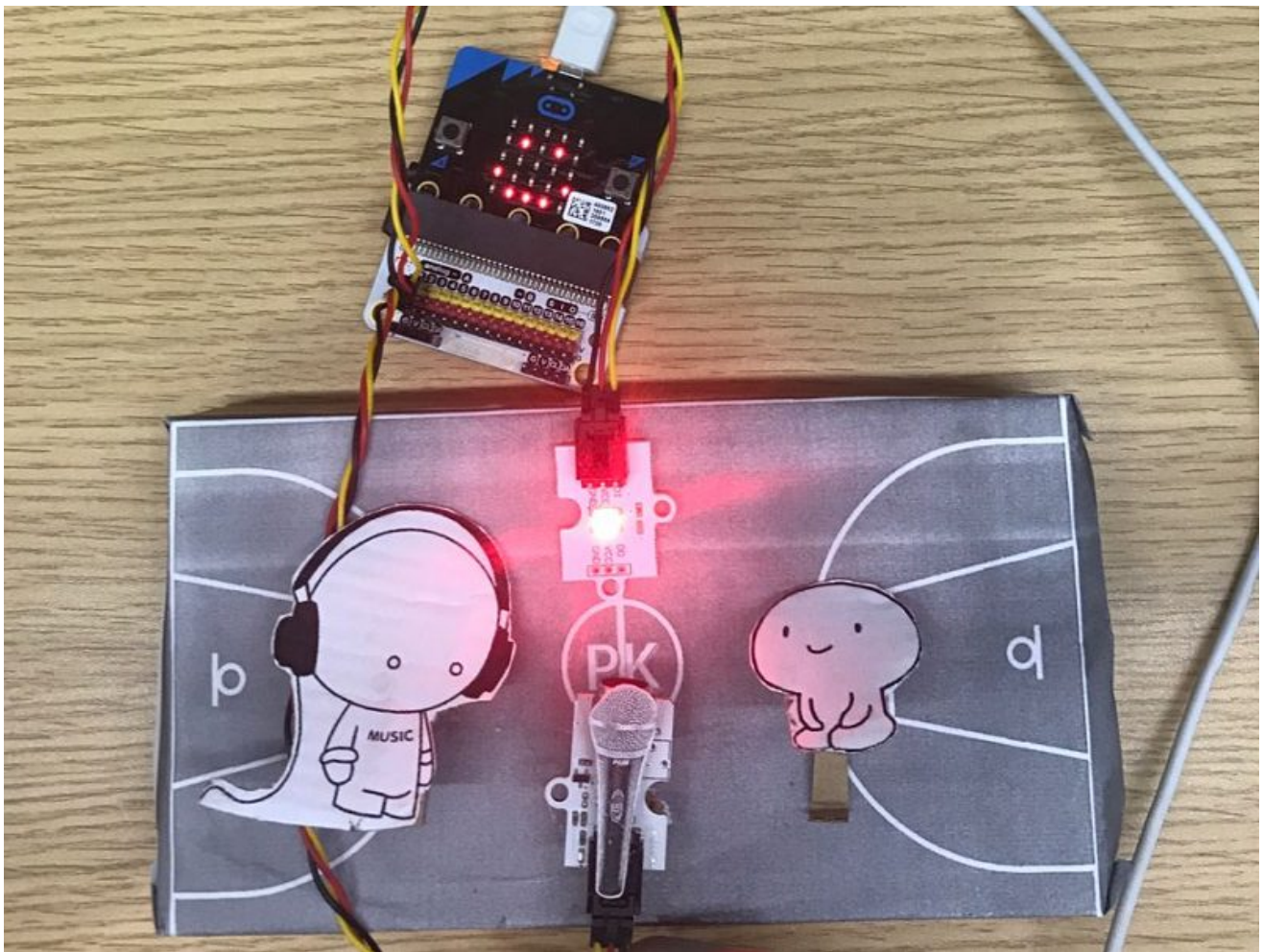




## 9.5. Hardware Connect

---

Connect the analog noise sensor to the P1 port of the expansion board. Connect the Rainbow LED to the P2 port of the expansion board.



## 9.6. Software

---

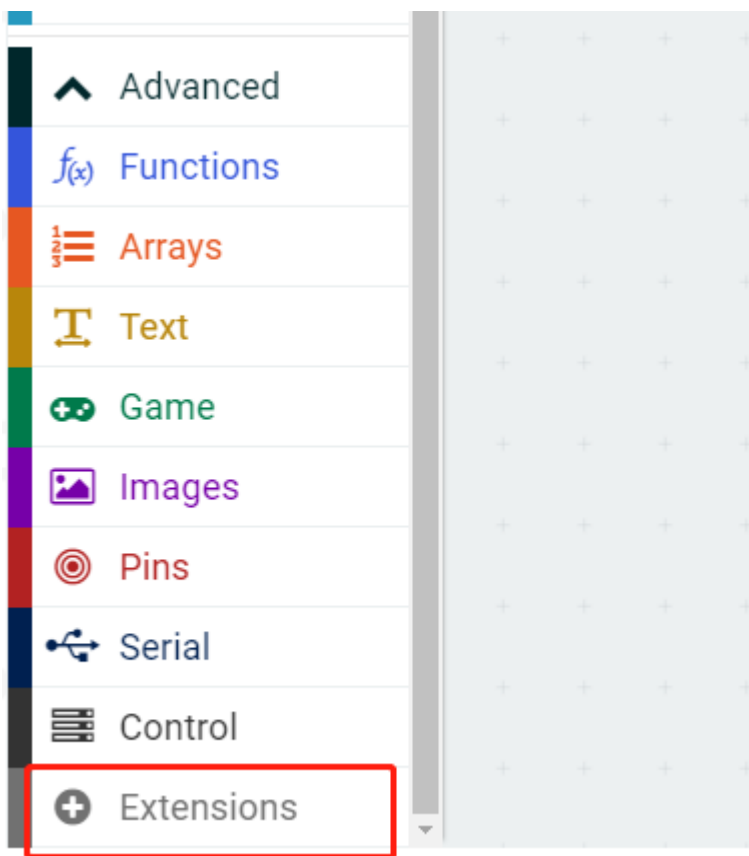
makecode

## 9.7. Programming

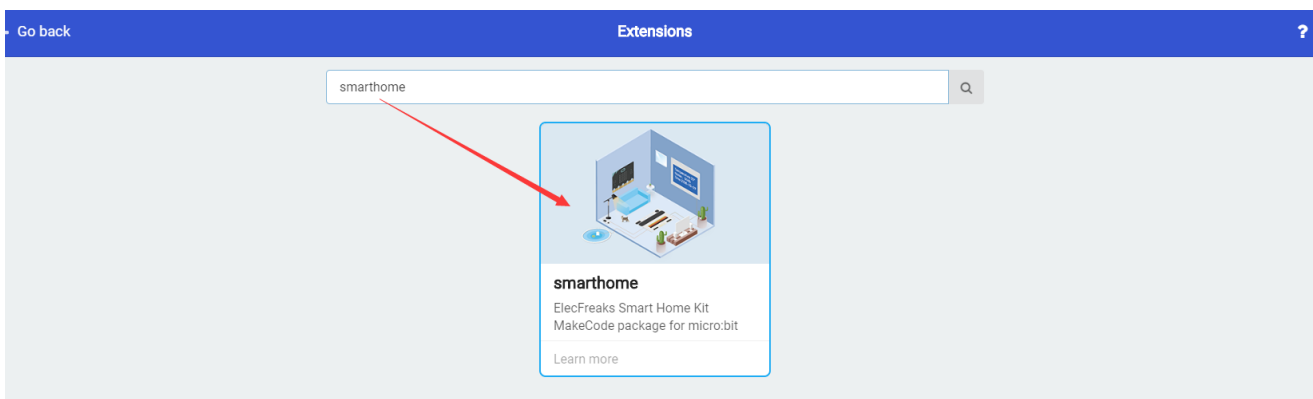
---

### Step 1

- Click “Advanced” in the makecode code drawer for more codes.



- We need to add a new codebase for programming of smart home. Finding “Extensions” at the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in the item menu bar.

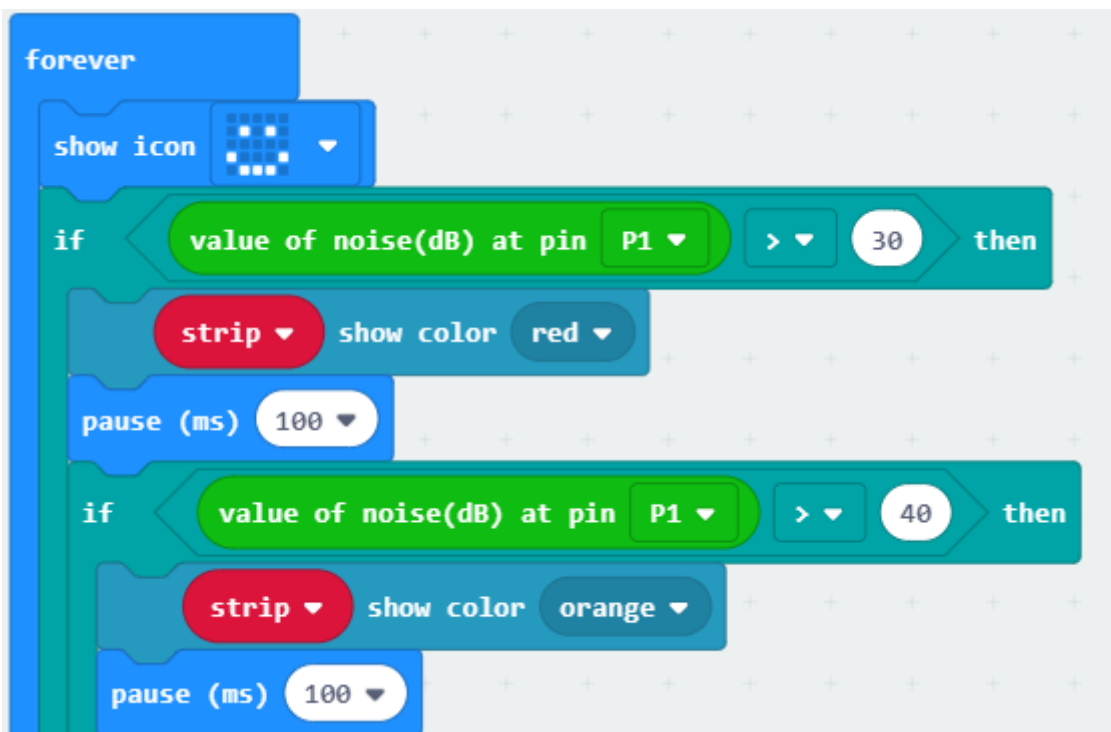
## Step 2

Snap the on start block from the Basic, then snap the set to NeoPixel at pin with leds as from the Neopixel. Initialize the rainbow LED to RGB of the P2 port.



### Step 3

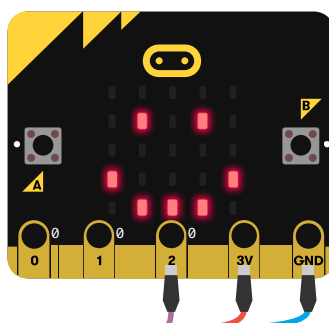
Snap the show icon in the forever, it means the smart decibel tester in proper functioning. Then snap an if statement to judge the value the analog noise sensor at P1 port. When the value is greater than 30(in quiet situation), snap the strip show color block and set the color to red. Duplicate the above code and change the value to 40,50,60..., set different color to each value.

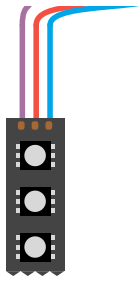


### Program

Program link: [https://makecode.microbit.org/\\_EseVwohUtCKo](https://makecode.microbit.org/_EseVwohUtCKo)

You also could directly download program by visiting website as below:



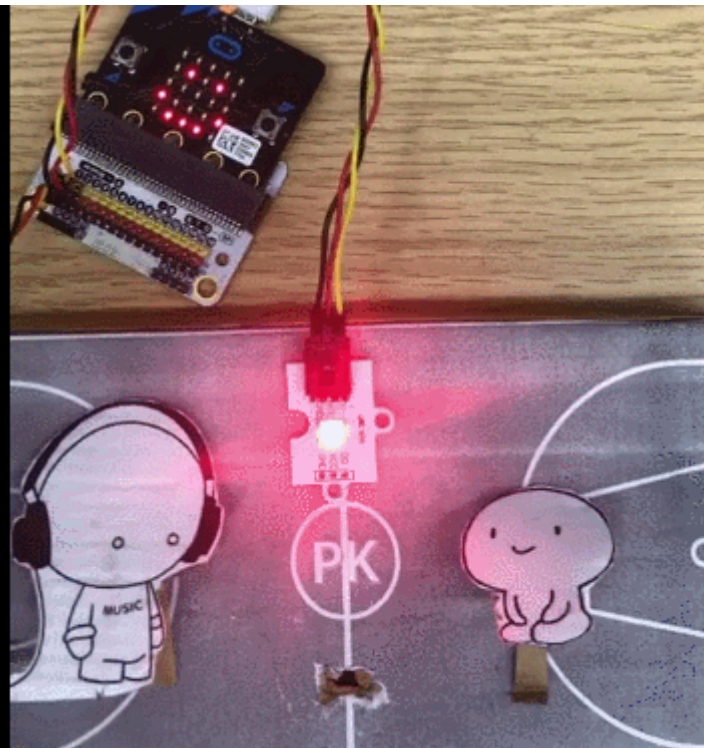


---

## 9.8. Result

---

- Different decibel makes rainbow LED in different colors.



## 9.9. Think

---

## 9.10. Questions

---

## 9.11. More Information

---

## 10. case 08 simple spirometer

### 10.1. Goal

---

- Make a simple spirometer.

### 10.2. Required Materials

---

- 1 X Smart Home Kit

### 10.3. Background

---

- The analog noise sensor E-Blocks can sense the outside noise signal. It can sense the vibration in air. The greater the vital capacity, the more air is expelled, and the greater the impact on the air. The air intensity is a detection index for a spirometer.

#### What is a “simple spirometer” ?

- The spirometer always use in physical examination for testing health. Using the micro:bit to make a simple spirometer and know your own physical condition.

#### Principle of a simple spirometer

- The analog noise sensor E-Blocks detects the vibration in air. Then you need to make 5 levels for your vital capacity.
- 

Level	Parameters
1	30db
2	50db
3	70db
4	90db
5	110db

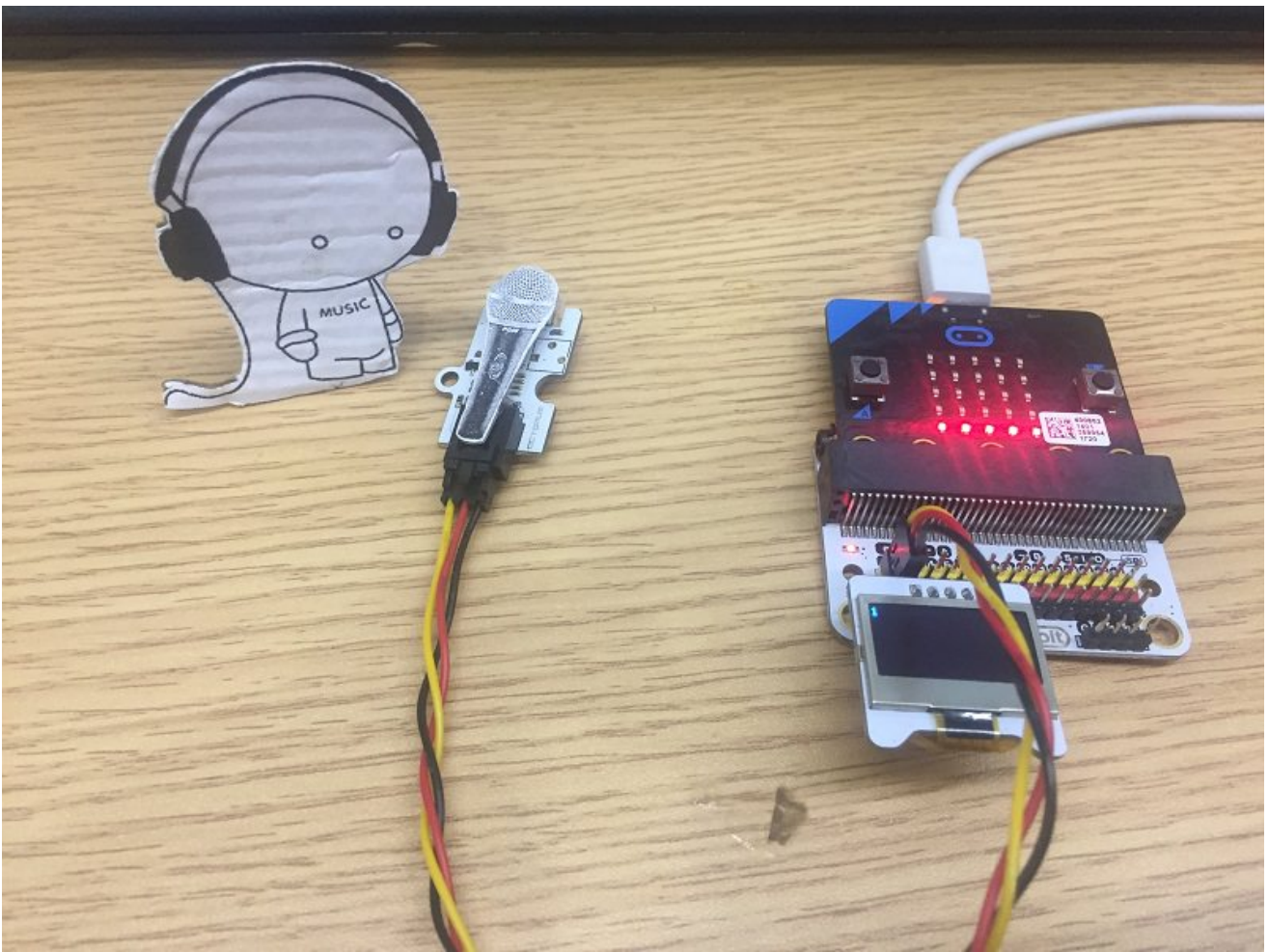
## 10.4. Practical Operation

---

- Prepare a scissors, a bottle of glue and a piece of cardboard.
- Stick the paper you prepared on the cardboard and clip it as you need.
- Set up as below:



Set and stick components as below:

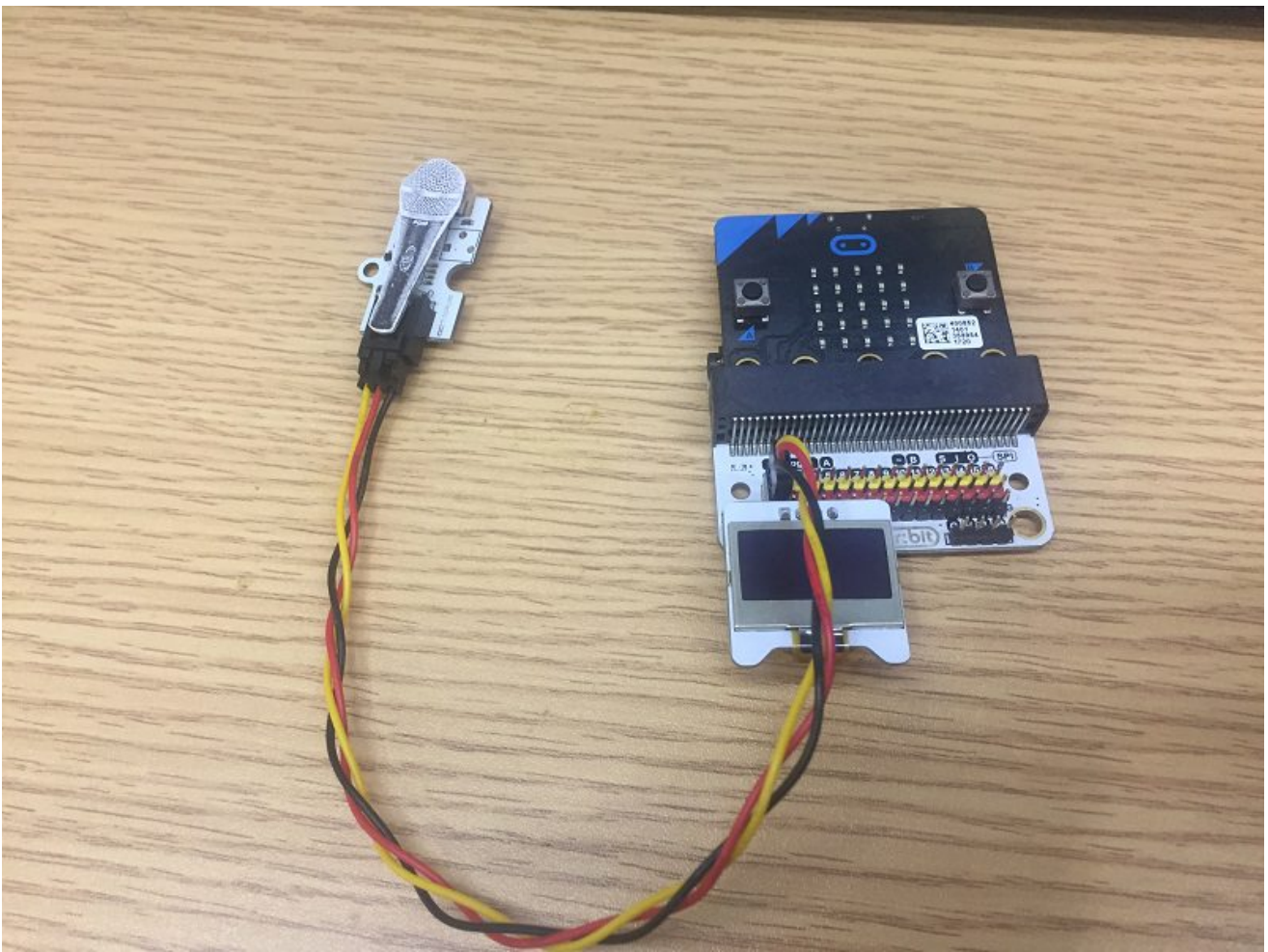


## 10.5. Hardware Connect

---

Connect the analog noise sensor to the P1 port of the expansion board. Connect the OLED screen to the IIC port of the expansion board.





## 10.6. Software

---

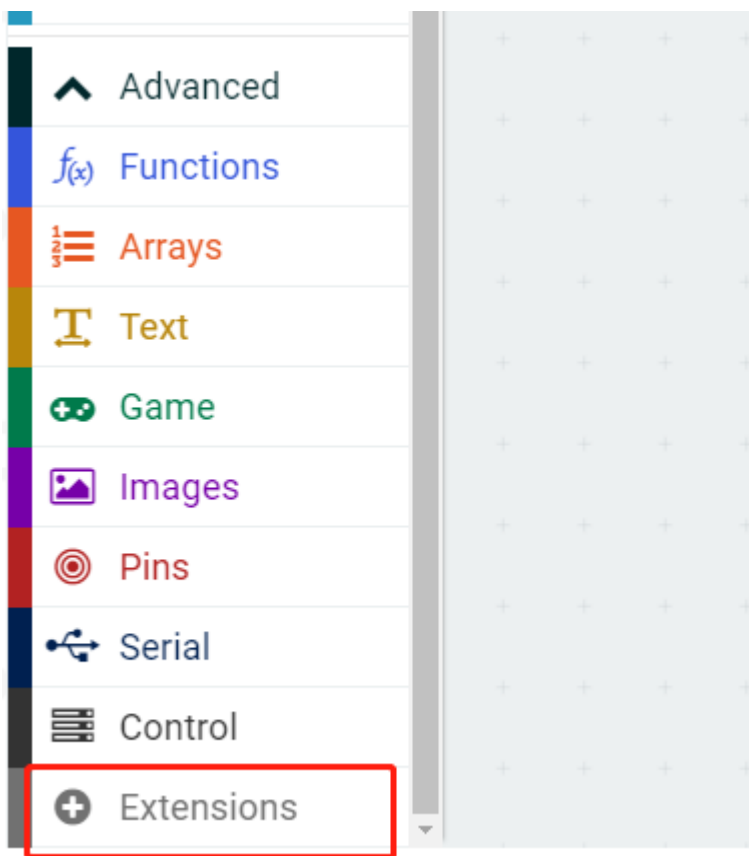
makecode

## 10.7. Programming

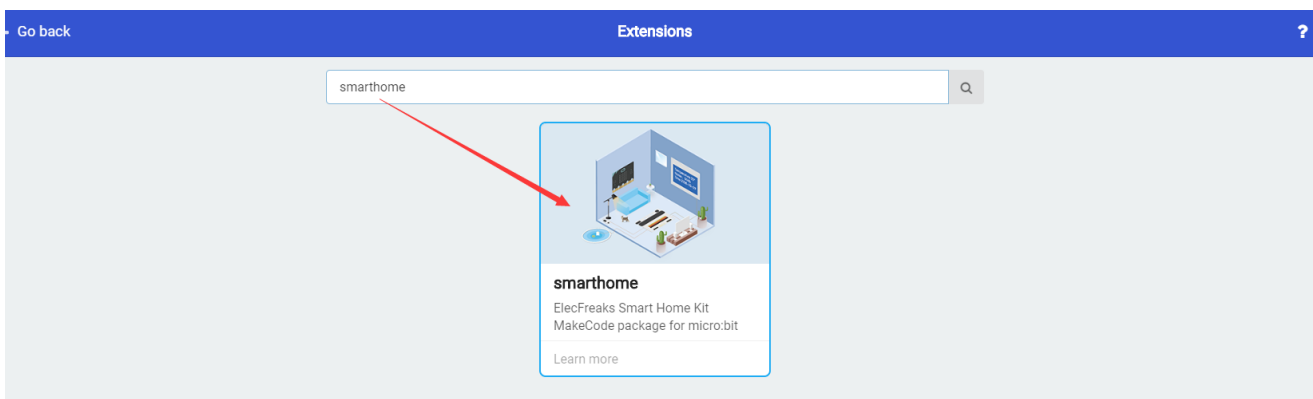
---

### Step 1

- Click “Advanced” in the makecode code drawer for more codes.



- We need to add a new codebase for programming of smart home. Finding “Extensions” at the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in the item menu bar.

## Step 2

Snap the on start from the Basic, snap the initialize OLED with block from the OLED and initialize the OLED screen. Then set a smile icon on the micro:bit for micro:bit' boot animation. Show the welcome to the game string on the OLED screen which means the test starts.

```
on start
  initialize OLED with height 64 width 128
  show icon
  show string "welcome to the game"
  pause (ms) 2000
```

### Step 3

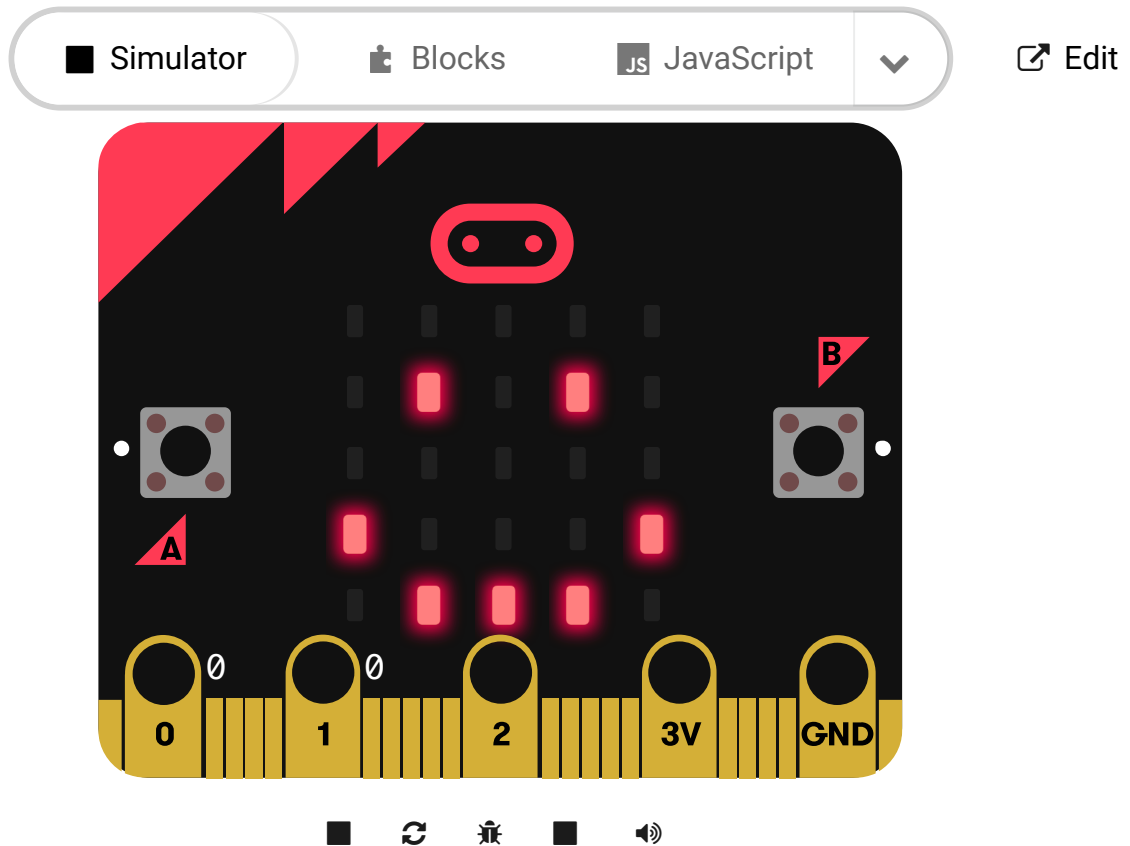
Snap an if statement under the forever loop. Read the value of the P1 port and judge what the level it is. The micro:bit's LED will show different height histogram for different levels. The icon will in full screen at the highest level. The OLED screen will show different numbers for different levels. It will show number 5 at the highest level. Duplicate above codings and judge 5 levels.

```
forever
  if value of noise(dB) at pin P1 > 30 then
    show leds
    clear OLED display
    show number 1
    pause (ms) 100
  if value of noise(dB) at pin P1 > 50 then
    show leds
    clear OLED display
    show number 2
    pause (ms) 100
  if value of noise(dB) at pin P1 > 70 then
    show leds
```

## Program

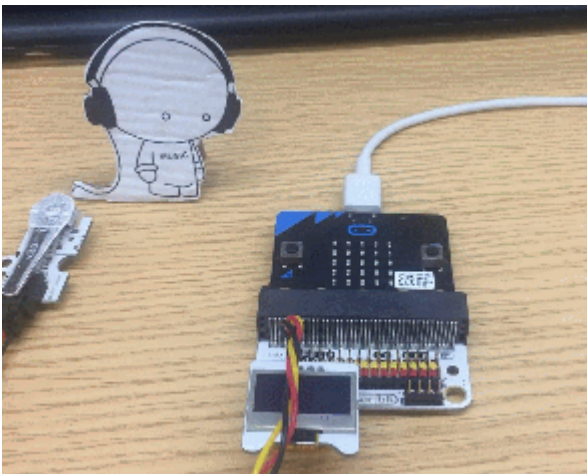
Program link: [https://makecode.microbit.org/\\_R8yPcAPMDJXM](https://makecode.microbit.org/_R8yPcAPMDJXM)

You also could directly download program by visiting website as below:



## 10.8. Result

- Blow to the analog noise sensor, you will know your vital capacity



## 10.9. Think

- What can we make by using the smart home kit except the spirometer

## **10.10. Questions**

---

## **10.11. More Information**

---

## 11. case 09 lie detector

### 11.1. Our Goal

---

- Make a lie detector.

### 11.2. Materials

---

- 1 X Smart Home Kit

### 11.3. Background

---

- Use a moisture sensor to detect material's electrical conductivity.

#### What is a lie detector?

- With this machine, the truth will never escape you!

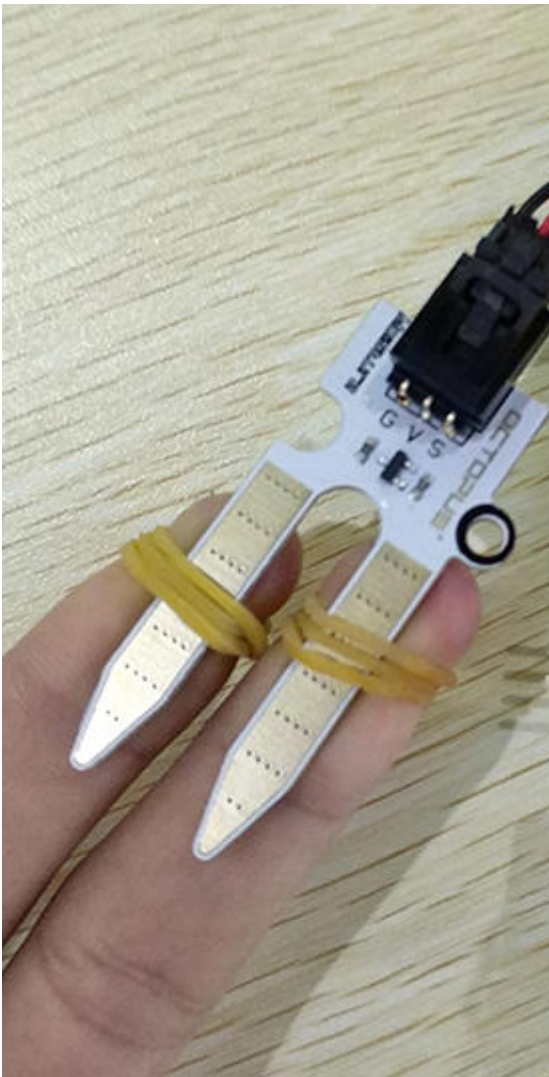
#### Pre Build Overview

- In this project, we will create a simple lie detector machine, which works by measuring the electrical conductivity of our skin. Upon feeling nervous, our skin's electrical conductivity will increase, and the moisture sensor can pick up on that. This allows us to determine if a person is telling the truth or not.

### 11.4. Practical Operation

---

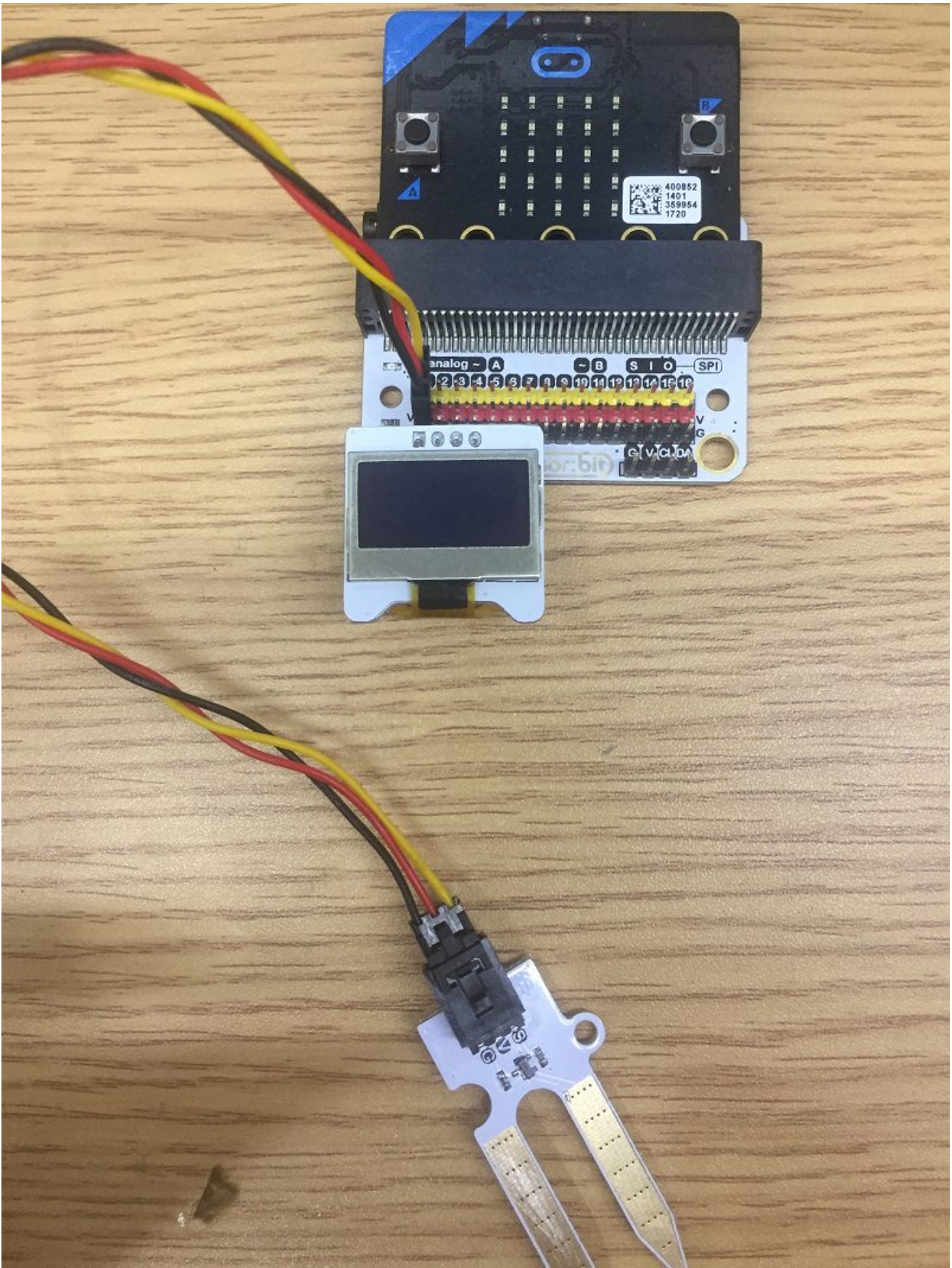
- A quiet and comfort room. Operation as below picture:



## 11.5. Hardware Connect

---

Connect the soil moisture sensor to P1 of the expansion board. Slot the OLED screen into IIC port of the expansion board.



## 11.6. Software

---

makecode

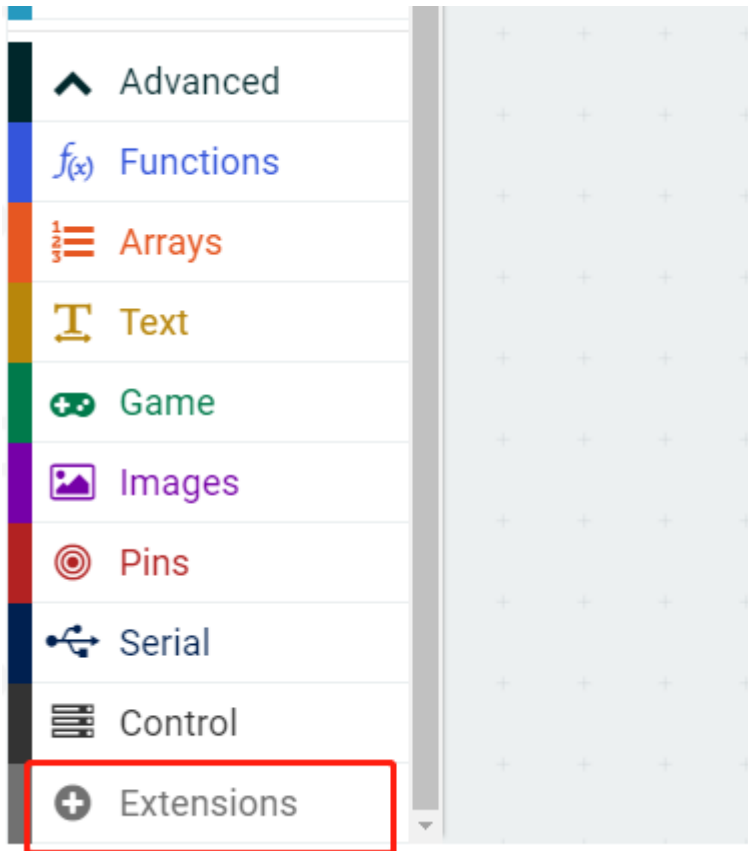
## 11.7. Programming

---

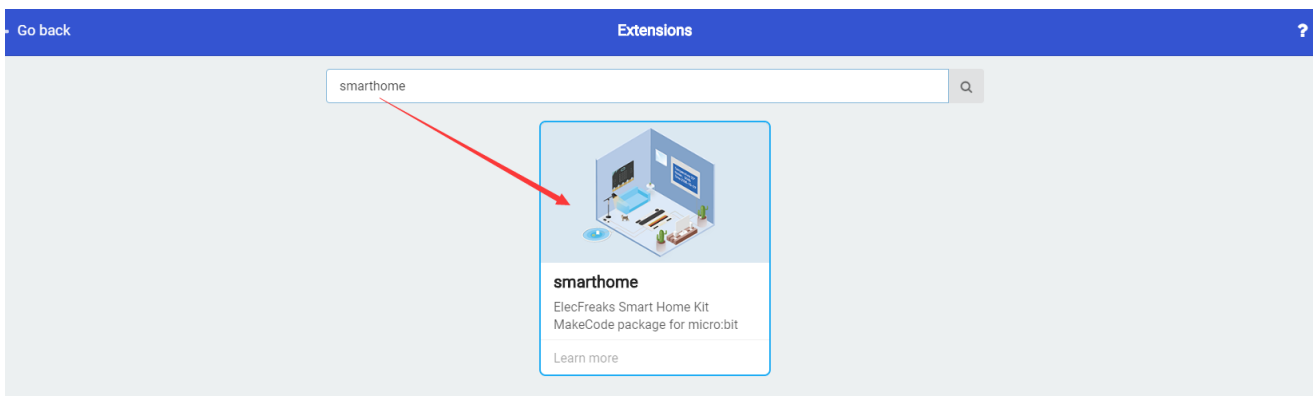


## Step 1

- Click “Advanced” in the makecode code drawer for more codes.



- We need to add a new codebase for programming of smart home. Finding “Extensions” at the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If there is a hint says some codebase will be deleted because of incompatibility. Don't worry. You could go ahead as the hint or build a new item in the item menu bar.

## Step 2

- First of all, initialize the OLED using blocks in the OLED section as shown in the picture.

```
on start
  initialize OLED with height 64 width 128
  show string "Please place your fingers on the sensor."
  pause (ms) 2000
```

### Step 3

- This part of the code allows the soil moisture sensor to measure and record down the electrical conductivity between the two fingers every few seconds for about a minute. Then, it calculates the average. This is the “calm” value when the user has not told any lies.

```
set std to square root of stddev ÷ 30
set list to empty array
repeat 30 times
  do
    list add value analog read pin P1 to end
    change elec by analog read pin P1
    pause (ms) 1000
  do
set average to elec integer ÷ 30
for element value3 of list
  do
    change stddev by value3 - average × value3 - average
show string "average is: "
show number square root of stddev ÷ 30
```

### Step 4

- After the initial readings have been made and recorded, the moisture sensor now measures the average electrical conductivity over five seconds.

```
forever
  set readings to 0
  repeat 5 times
    do
      change readings by analog read pin P1
      pause (ms) 500
```

## Step 5

- After the initial readings have been made and recorded, the moisture sensor now measures the average electrical conductivity over five seconds. If it is higher than the average added to the standard deviation, we can conclude that the user has an abnormally high electrical conductivity and is thus lying. Then, the LED screen would show an “X” shape.

```
if readings integer ÷ 5 ≥ average + std then
  show string "reading above threshold"
  show number readings integer ÷ 5
  show icon X
  pause (ms) 1000
  clear screen
```

## Step 6

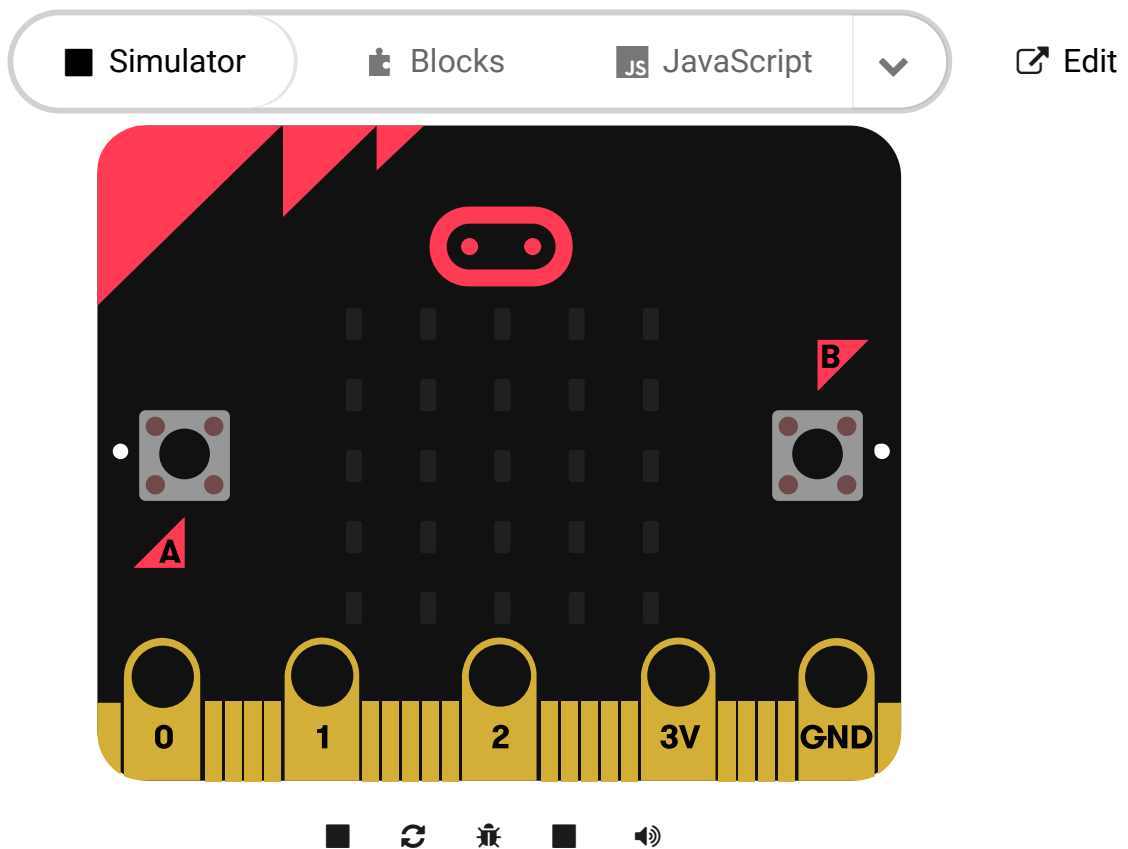
- If it is lower than the average added to the standard deviation, we can conclude that the user has a normal electrical conductivity and is thus no lying. Then, the LED screen would show an “√” shape.

```
else
  show number readings integer ÷ 5
  show icon √
  pause (ms) 1000
  clear screen
```

## Program

Program link: [https://makecode.microbit.org/\\_gvHXo5WVM8cP](https://makecode.microbit.org/_gvHXo5WVM8cP)

You also could directly download program by visiting website as below:



---

## 11.8. Result

- You will have to attach each prong of the soil moisture sensor to one of your fingers. After 10 seconds, the test will begin. The LED screen will show an “X” shape when the player is lying; The LED screen will show an “√” shape when the player is telling the truth.

---

## 11.9. Think

- Is there any way to make the result more accurate?

---

## 11.10. Questions

---

## 11.11. More Information

---

## 12. case 10 simple alarm box

### 12.1. Our Goal

---

- Make a simple alarm box.

### 12.2. Materials

---

- 1 X Smart Home Kit

### 12.3. Background

---

- The crash sensor can deliver a crash signal. When the clips being touched or being relaxed, it will deliver respectively signal.

#### **What is a simple alarm box.**

- In this project, we are going to create a simple alarm device which will alert the owner if someone has stolen his or her property. The red LED will blink when the crash sensor detects that the object has been taken away. Otherwise, the green LED will light up continuously. The OLED will display the status of the device.

#### **Pre Build Overview**

- The red LED will blink when the crash sensor detects that the object has been taken away.
- Otherwise, the green LED will light up continuously. The OLED will display the status of the device.

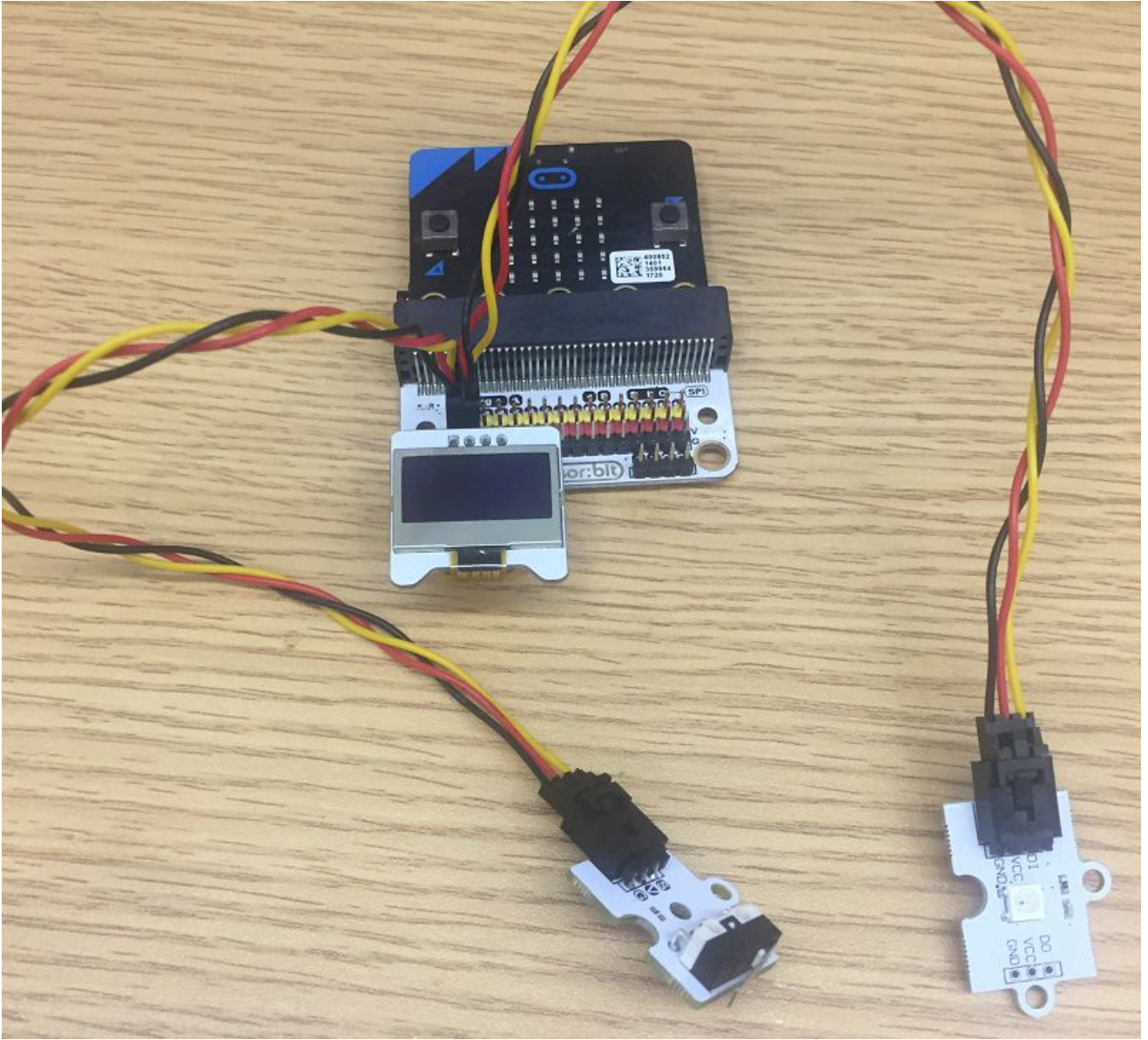
### 12.4. Practical Operation

---

- Prepare a scissors, a bottle of glue and a piece of cardboard.
- Set up as below:



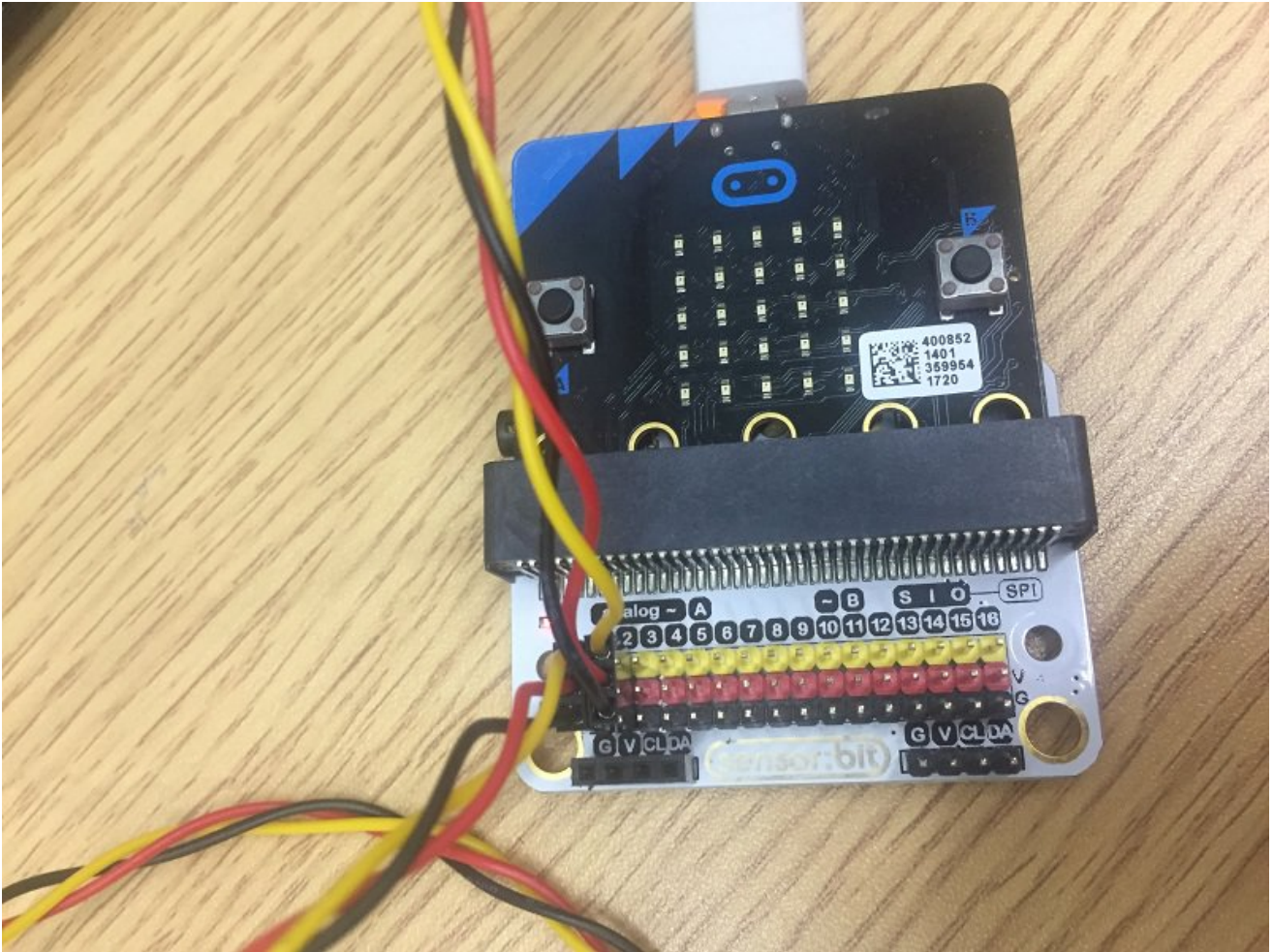
Set and stick components as below:



## 12.5. Hardware Connect

---

Connect the crash sensor to P1 port of the expansion board; Connect the rainbow LED to P2 port of the expansion board;



## 12.6. Software

---

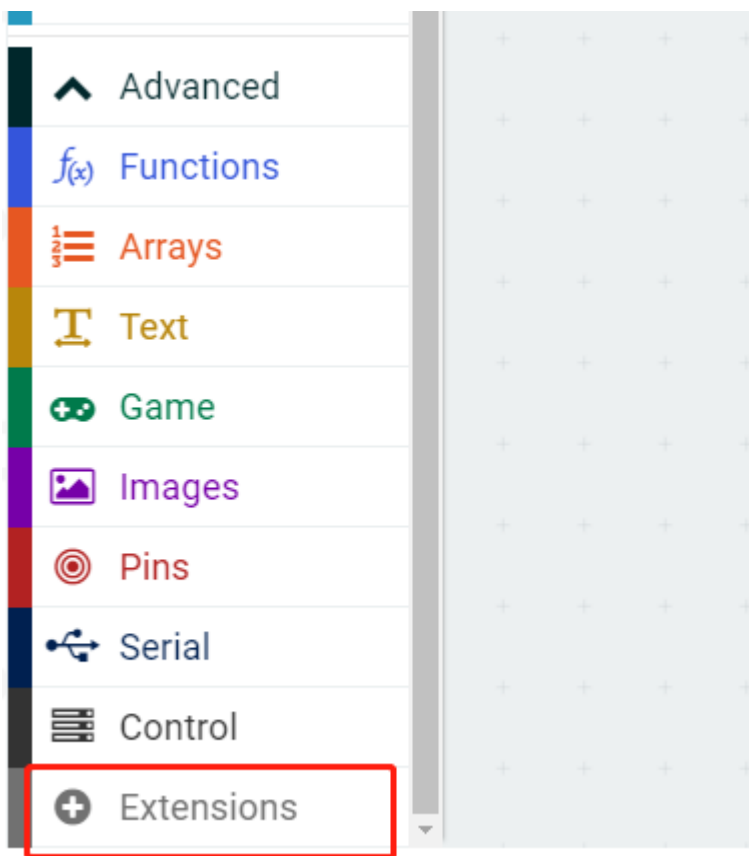
makecode

## 12.7. Programming

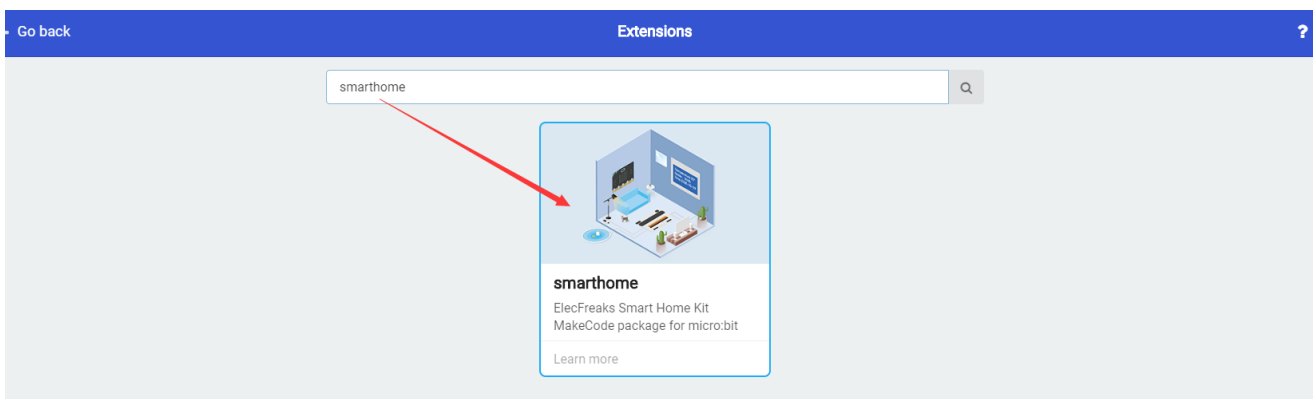
---

### Step 1

- Click “Advanced” in the makecode code drawer for more codes.



- We need to add a new codebase for programming of smart home. Finding “Extensions” at the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If you get a warning telling you some packages will be removed because of incompatibility issues, either follow the prompts or create a new project in the Projects file menu.

## Step 2

First of all, initialize the OLED using blocks in the OLED section as shown in the picture. Snap the “set to Neopixel” from the Neopixel, set rainbow led of the P2 port to singel light in RGB mode. And snap the “setup crash sensor” from the Smarthome Libraries and set it to P1 port to detect the press of the crash sensor.



```
on start
  initialize OLED with height 64 width 128
  set strip to NeoPixel at pin P2 with 1 leds as RGB (GRB format)
  Setup crash sensor at pin P1
```

### Step 3

Since there are only two conditions, we need only one 'else-if' statement. When the Crash Sensor is pressed, the green Octopus LED will light up. Or else, if no force is applied to the Crash Sensor, the red LED will blink continuously.

```
forever
  if crash sensor pressed then
    show string "your treasure is safe"
    strip show color green
  else
    show string "your treasure not safe"
    strip show color red
```

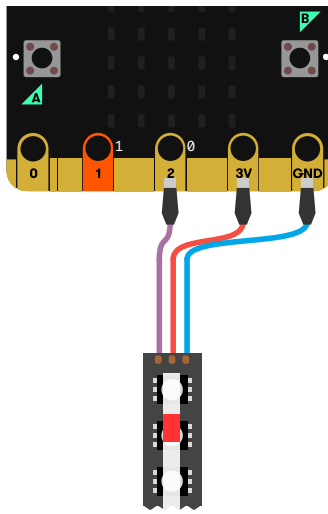
### Program

If you don't want to type these code by yourself, you can directly download the whole program from the link below:

Program link: [https://makecode.microbit.org/\\_HsM6PrRhAA9c](https://makecode.microbit.org/_HsM6PrRhAA9c)

You also could directly download program by visiting website as below:

■ Simulator    Blocks    JS JavaScript    Edit

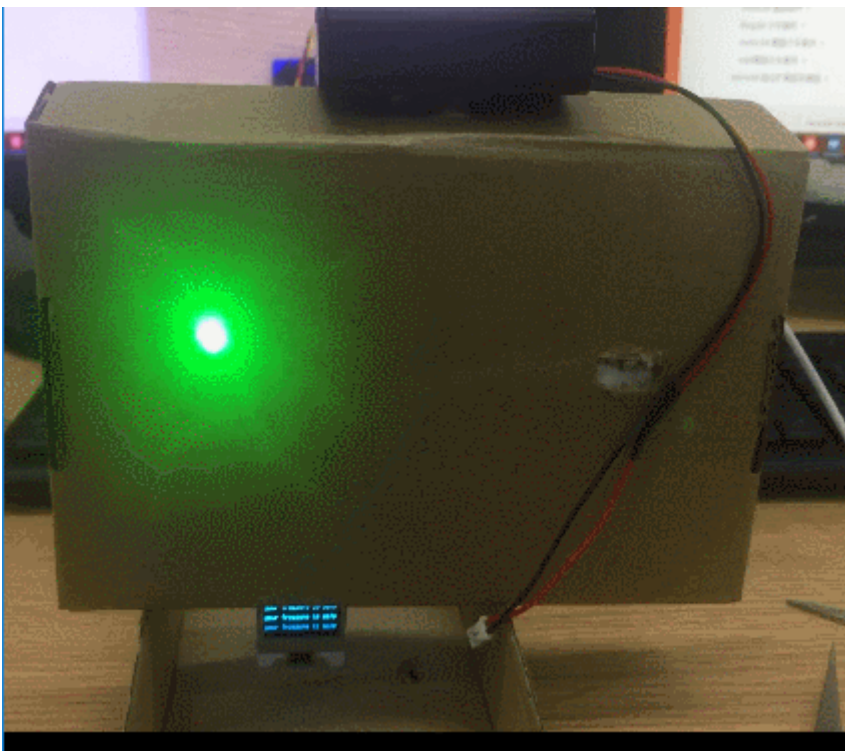


---

## 12.8. Succeed!

---

- We can see the green light illuminates as showed in the picture below. When we take away the book or something else you placed, you can see the red light starts to flash while the green light turned off.



## 12.9. Think

---

- Could you use this kit to make a intruder detection ?

## 12.10. Questions

---

## 12.11. More Information

---

## 13. case 11 intruder detection system

### 13.1. Our Goal

---

- Make a simple intruder detection system.

### 13.2. Materials

---

- 1 X Smart Home Kit
- A scissors
- A bottle of glue
- A piece of cardboard

### 13.3. Background

---

- The buzzer sounds using a oscillator.

#### What is a “intruder detection system” ?

- In this project, we are going to create an intruder detection system which will sound when someone opens the door. The status of the house will be displayed on the OLED.

#### Principle of a simple intruder detection

- The crasher sensor receives crash signal and send the alarm signal to the micro:bit. Then the buzzer will sound and the status of the house will be displayed on the OLED.

### 13.4. Practical Operation

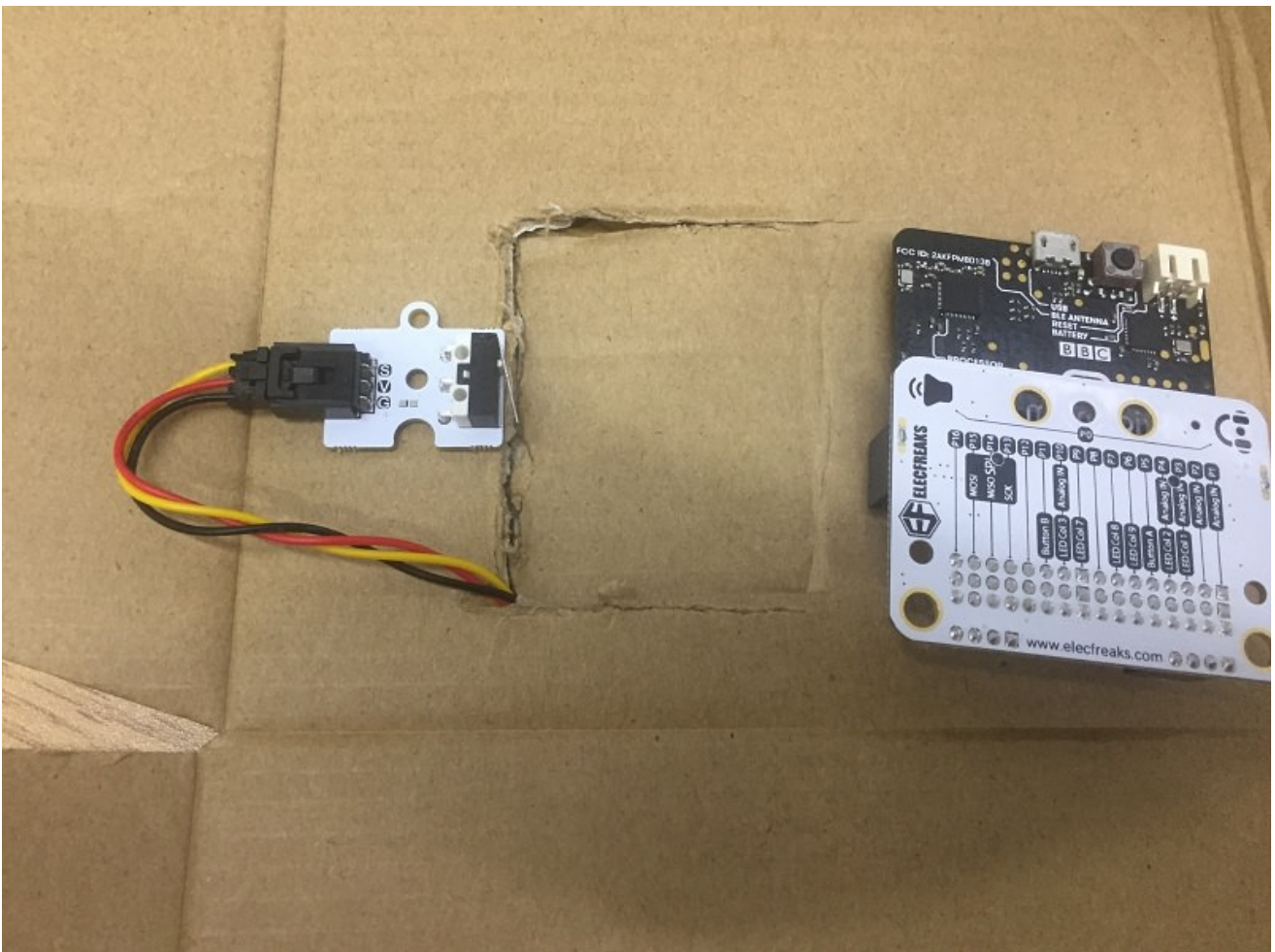
---

- Prepare a scissors, a bottle of glue and a piece of cardboard.
- Stick the paper you prepared on the cardboard and clip it as you need.
- Set up as below:

The front side:

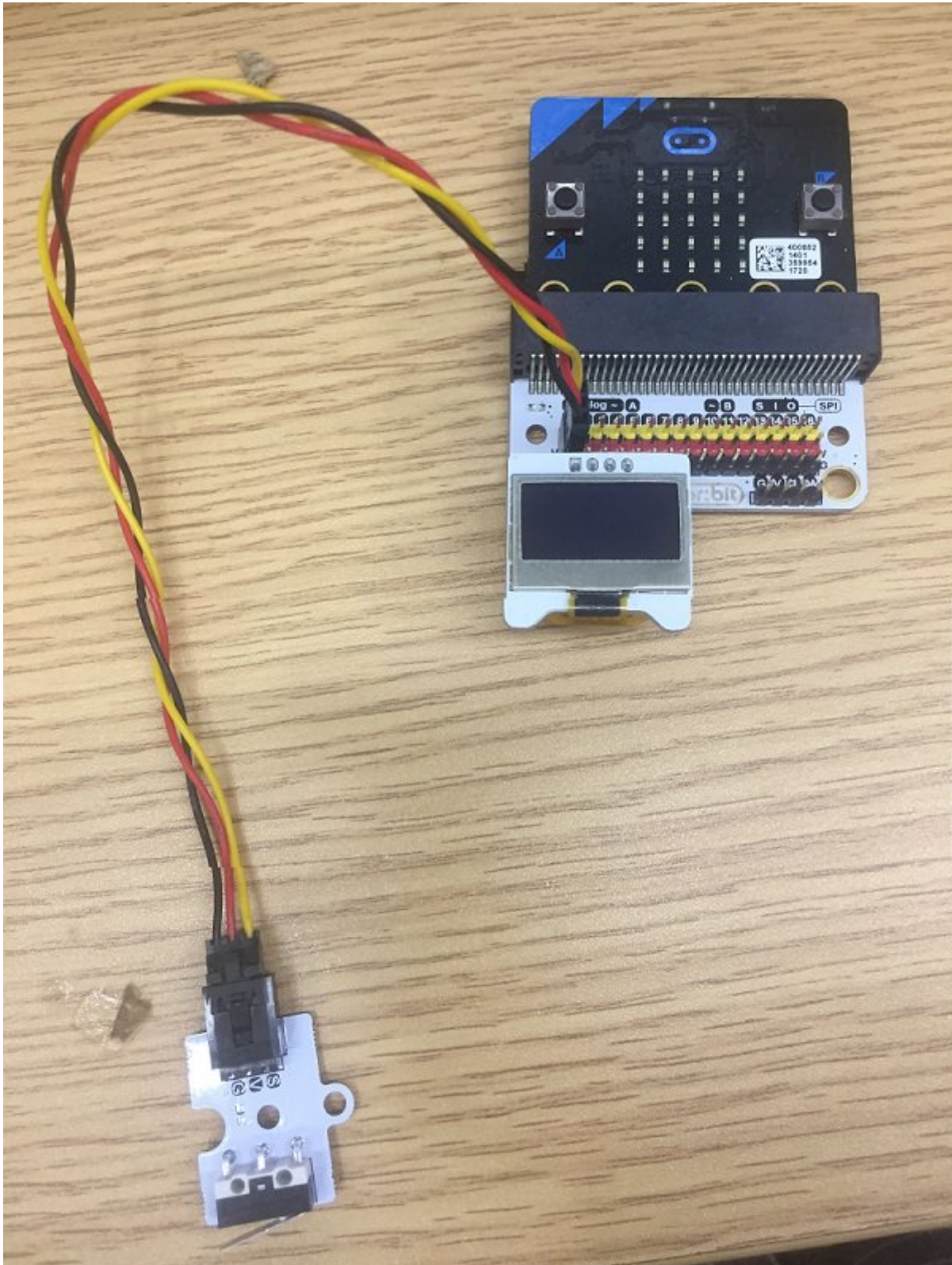


The back side:



## 13.5. Hardware Connect

Connect the crash sensor to the P1 port of the expansion board. Plug in the OLED as shown in the picture below.



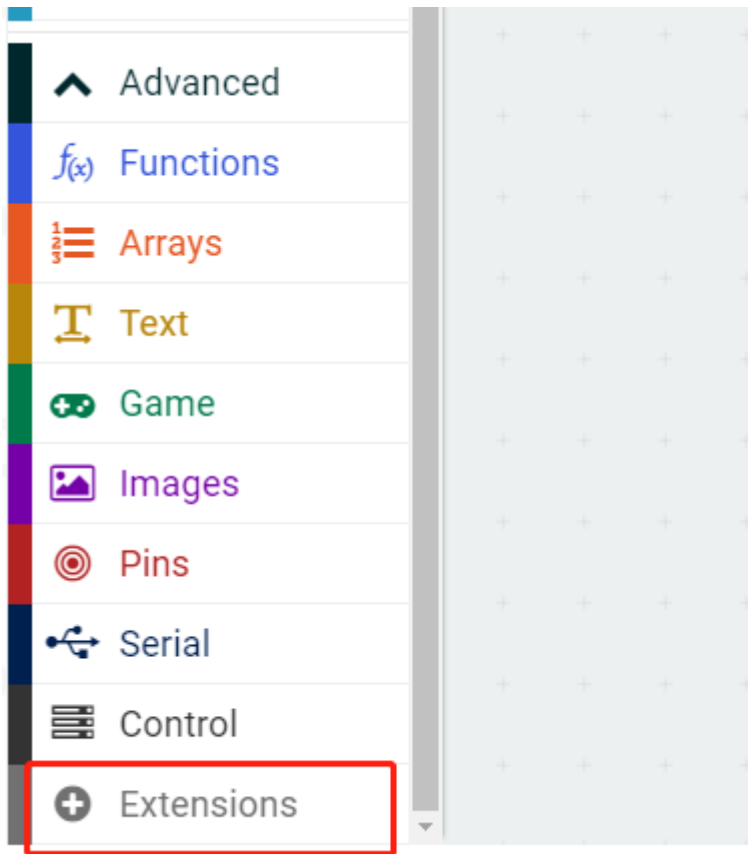
## 13.6. Software

makecode

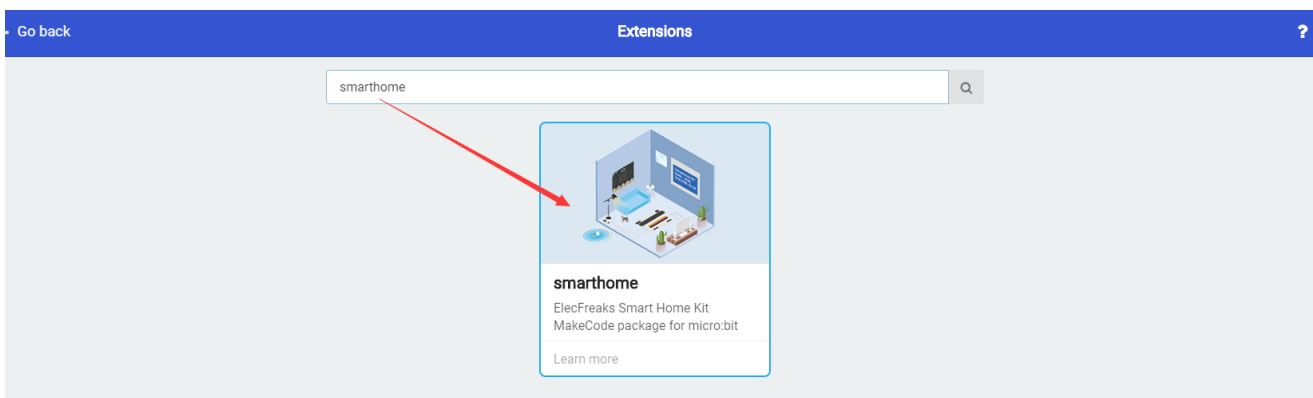
## 13.7. Programming

## Step 1

- Click “Advanced” in the makecode code drawer for more codes.



- We need to add a new codebase for programming of smart home. Finding “Extensions” at the bottom of code block and click it. Then a message box will show up, search “smart home”, and download this new codebase.



Note: If you get a warning telling you some packages will be removed because of incompatibility issues, either follow the prompts or create a new project in the Projects file menu.

## Step 2

- Snap the on start block from Basic, set the P1 port to touch detect port.

```
on start
  initialize OLED with height 64 width 128
  Setup crash sensor at pin P1
```

### Step 3

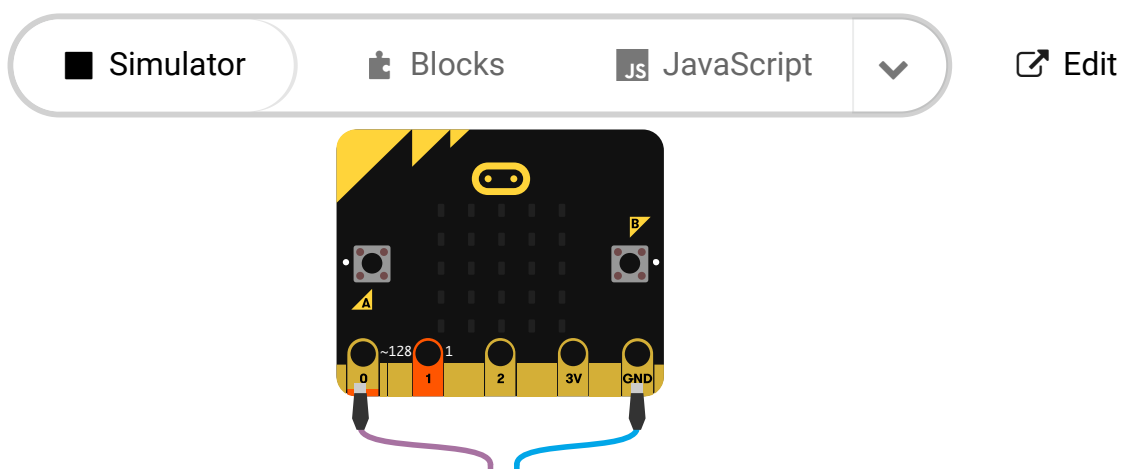
- Since there are only two conditions, we need only one “else-if” statement. When crash sensor is triggered, the buzzer will sound and the OLED will display the message “Intruder Detected”. Or else, if there is no force is applied to the crash sensor, the buzzer will not sound and the OLED will display the message “The house is safe”.

```
forever
  if crash sensor pressed then
    show string "your house is safe"
  else
    show string "Intruder Detected"
    start melody ba ding repeating once
```

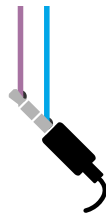
### Program

Program link: [https://makecode.microbit.org/\\_D6v8RH0dFYk1](https://makecode.microbit.org/_D6v8RH0dFYk1)

You also could directly download program by visiting website as below:







---

## 13.8. Result

---

-You have created a intruder detector!

## 13.9. Think

---

- What can you do more with the smart home kit?

## 13.10. Questions

---

## 13.11. More Information

---