SMARTHON

micro:bit

SMART CITY IOT

STARTER KIT FOR MICRO:BIT

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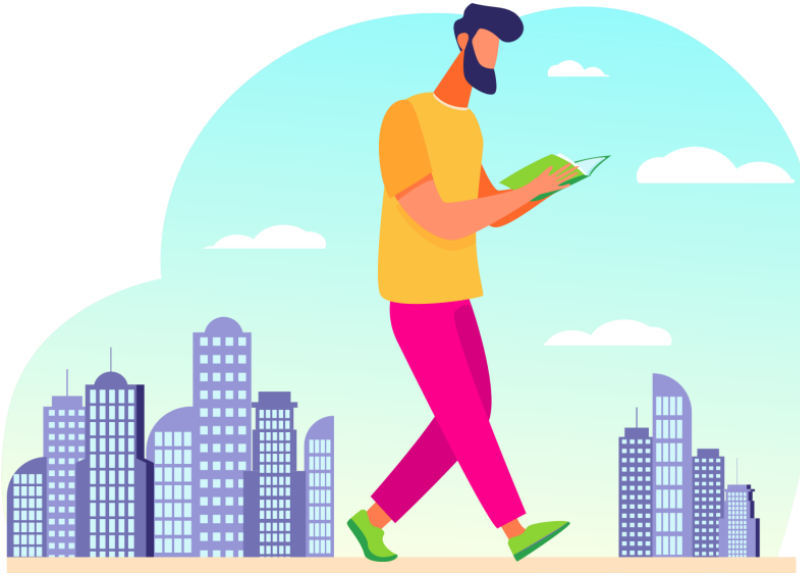
ABOUT SMARTHON

SMARTHON LIMITED, based in Hong Kong, design, manufacture, and sell friendly products for Educators and Creatives focusing on regular course like General Studies. Our mission and vision are to encourage technology in education for all people with high quality of education and learning.

The establishment of SMARTHON is to design simplified devices and apply the ever-changing technology development to teaching. For example, teachers can use Micro:bit and sensors to teach students to design a small greenhouse system and then use the Internet of Things technology to quickly transmit relevant values to smart devices. Teachers can change the temperature or humidity in real-time to allow students to observe different changes, record them, and then use them for study, analysis, and understanding of the operation of the greenhouse system.



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CONTENT

CONTENT

SMARTHON SMART CITY IOT STARTER KIT

SMARTHON Smart City IoT Starter kit is designed to introduce Internet of things (IoT). With basic knowledge of computing knowledge and electronics provided in the kit, you can be a city creator and build a unique IoT system in the city. Based on Smarthon IoT board, which is compatible with multiple sensors and actuators, you can design city features; for example: using sensors to detect traffic status and upload city information to the internet.

https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/index.html

WHAT IS SMART CITY?

SMARTHON

Smart city is a framework, integrating the information and communications technology (ICT) to improve the city's sustainability, efficiency and quality of life, in 6 major area - mobility, living, environment, people government and economy.

SMART LIVING
Using IoT/technology to improve the convenience / standard of living

SMART GOVERNMENT
government that support the adoption and development of technology in public/ private sectors and city infrastructure

SMART ENVIRONMENT
Monitor pollution and reduce waste, develop a green community

SMART ENCONOMY
strengthen the current economic pillars and develop new pillars with technology

SMART MOBILITY
Enhance the travel experience by providing real time information

SMART PEOPLE
Provide training programming to nurture IT professions

WHAT IS IOT?

Internet of things (IoT) is a network connecting various objects (tangible or intangible objects, including computer devices, systems) via internet. By adding sensors, software or other technology on the object, it allows data connecting and exchange without requiring human-to-human or human-to-computer interaction. There are three ways of information sharing in IoT:

1. Collect and share information

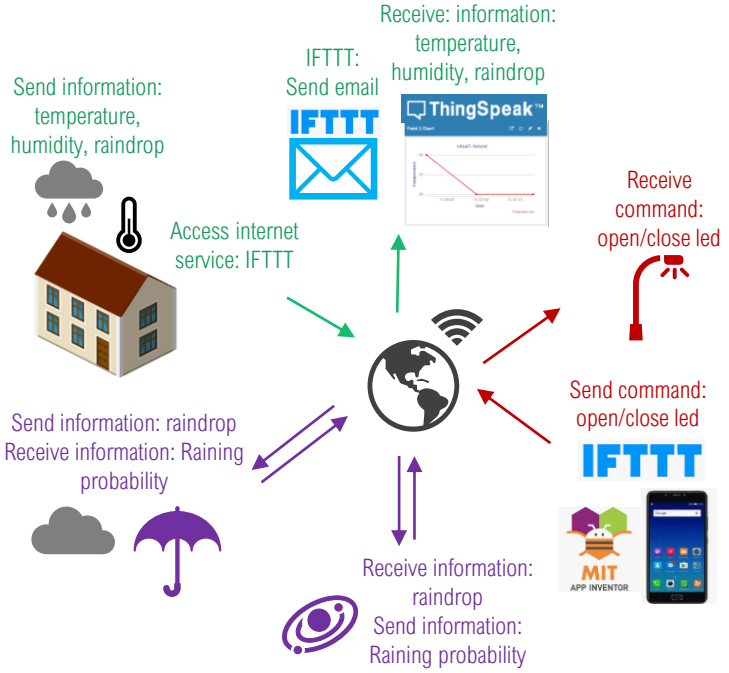
Sensors on the things collect information (temperature, humidity, raindrop, etc) and upload to the central system for further analysis
Example: Upload data to ThingSpeak
Example2 : Send Email by IFTTT

2. Receive information and react

Thing that wait for the command for an action
Example: Control micro:bit by App Inventor 2/IFTTT Services

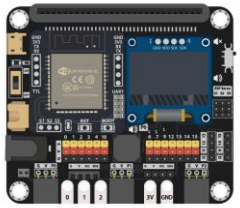
3. Doing both

Collect information and share via internet, it will react for further action
Example: Object to Object communication
A smart umbrella that collect raindrop information and send to the climate system. it will receive the raining probability from the system and then open/close the umbrella



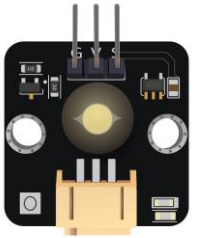
PART LIST

SMARTHON IOT BIT:
It is an IoT orientated expansion board for Micro:bit. It can connect to different sensors or actuator



TRAFFIC LIGHT MODULE:
It includes three different colors LED which are red, yellow and green color, like the real-life traffic light

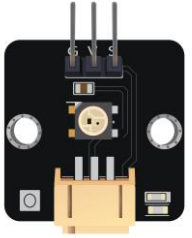
WHITE LED MODULE:
It can emit white LED light with different brightness by user input



RAINDROP SENSOR:
It uses conductivity to determine if the raindrops are on the board

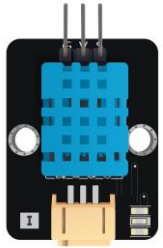
DISTANCE SENSOR:
It uses ultrasonic to measure the distance between the sensor and object

MULTI-COLOR LED (WS2812B):
It is an integrated LED chip which can create different RGB color by programming



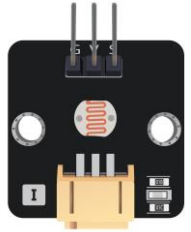
PART LIST

TEMPERATURE AND HUMIDITY SENSOR (DHT11):
It contains two components to detect humidity and temperature

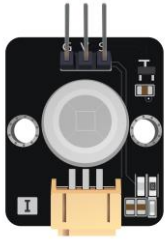


NOISE SENSOR:
use a microphone with an amplifier to detect the sound level of the environment

LIGHT SENSOR:
It uses one photoresistor to detect the luminance of environment

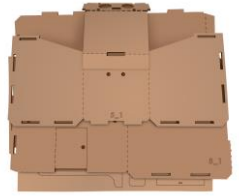


MOTION SENSOR:
It use a pyroelectric infrared sensor to detect any moving object at front



180° SERVOS:
It allows the shaft to be positioned between 0 and 180 degrees

CARDBOARD AND WOODEN MODEL:
It allows sensors/ actuators to be placed on it



CITY MAP:
It is approximately 594mm*420mm, cardboard model can be placed on it

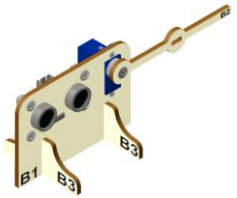
OTHERS:
(9) MODULE WIRE · (8) EXTENSION WIRE · (12) SCREW M2*10mm · (6) SCREW M3*10mm · (30) SCREW M4*10mm · (12) NUT M2 · (6) NUT M3 · (30) NUT M4 · (3) PAPER CLIP · (2) L-SHARPED STAND · (1) SCREWDRIVER · (2) SANDPAPER · (1) BLU TACK · (1) USB CABLE · (1) BATTERY HOLDER · (1) SMART CITY KIT MANUAL BOOK.

MODEL LIST

MODEL A:
It is a smaller size playground lamp with slope Light. There is a sensor port on the side (e.g. motion sensor can be attached to detect movement)

Playground Lamp

MODEL B:
In this model, distance sensor is to detect if there are cars in front of the model, while servo control the angle of the access barrier.

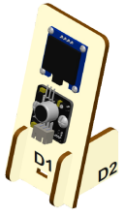


Car Park Access Barrier

MODEL C:
It is a garbage bin with a distance sensor to detect the amount of garbage inside. There is a port in front of the bin. You can attach multi-color to indicate the garbage level.

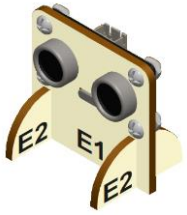
Garbage Bin

MODEL D:
It is an OLED stand used to display useful information. To collect information, user can attach sensors below OLED (e.g. sound sensor or temperature sensor).



OLED Display Stand

MODEL E:
In this model, distance sensor can be attached to measure the approximate distance between the model and the target object. It can be used with Model D to display the distance/speed.



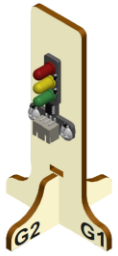
Car speed monitoring

MODEL LIST

MODEL F:
It is small building model. There are several ports on the top of the model. You can put sensors/actuators for different purpose. (e.g. rain drop sensor, temperature and humidity sensor)

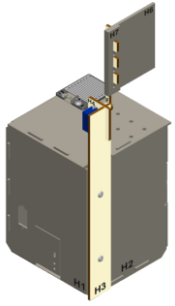
Small Building
(Apartment, communal building)

MODEL G:
Traffic light module can be attached to this model. It is placed on the city street with 3 LED to indicate current traffic state.



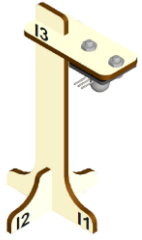
Traffic Light

MODEL H:
It is a tall building model with an automatic cloth rack controlled by the servo. Sensors/actuators can be attached on top for different purpose. (e.g. rain drop sensor, temperature and humidity sensor)



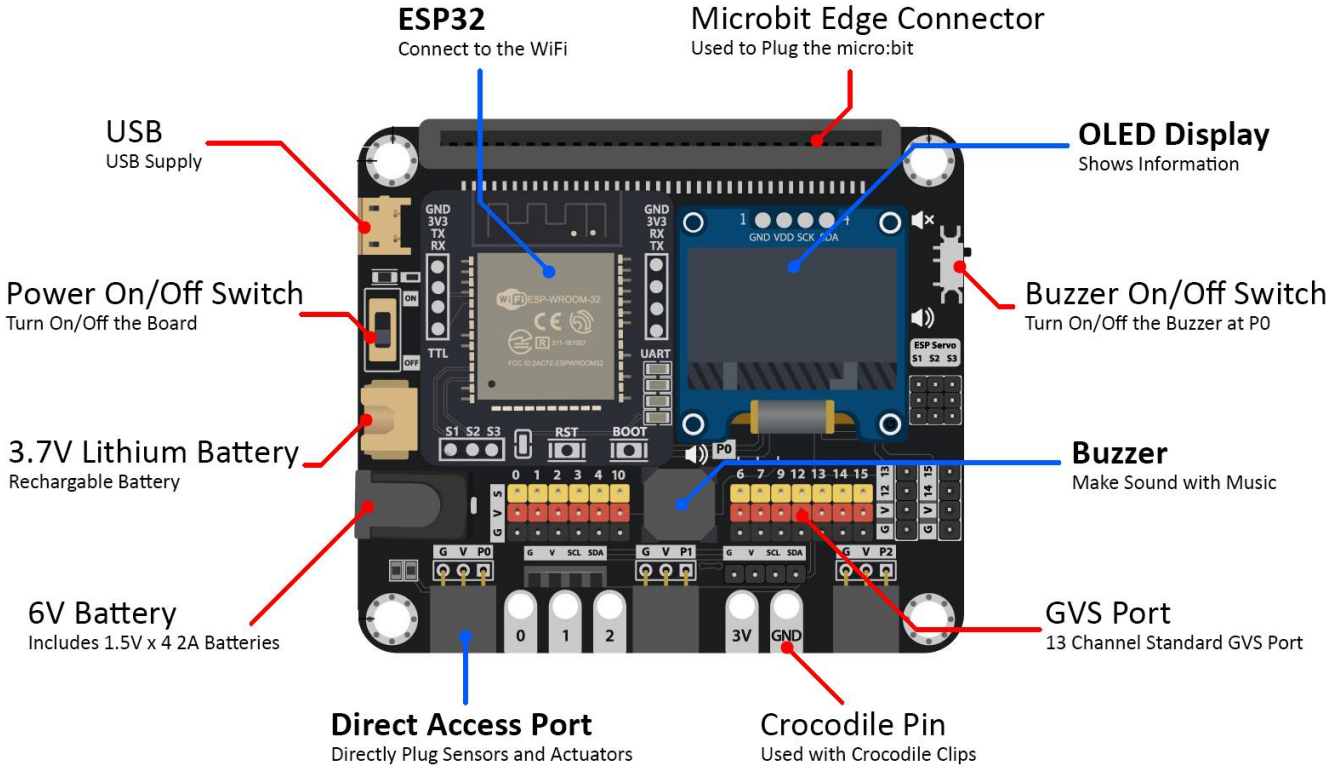
Tall Building
(Skyscrapers, high-rise housing)

MODEL I:
It is a taller sized lamp with slope light on the city street. It supports smart lighting system in the city. In your project, you can implement IoT connection in the lighting system.



Streetlight

IOT:BIT



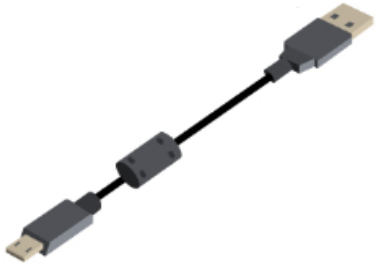
https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/index.html

POWER SUGGESTION

IoT:bit Voltage Range: 3.7V DC-6V DC. There are 3 options for the power supply

OPTION 1

- USB

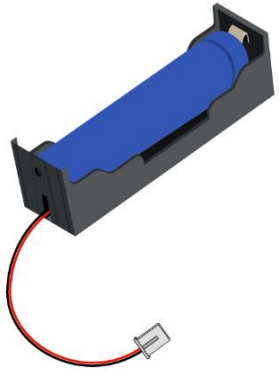


OPTION 2

- 4 XAA Batteries (Battery Not Included)

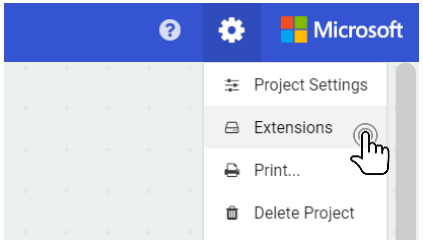
OPTION 3

-18650 3.7V Battery (Battery and holder are not included) with standard 2.54 interface

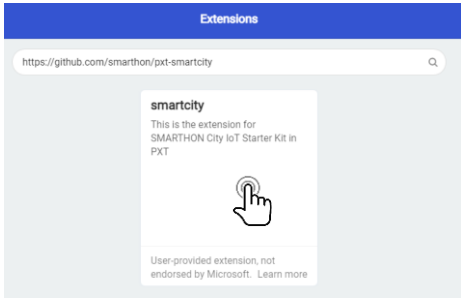


GETTING STARTED:
ADD THE EXTENSION ON MICRO:BIT

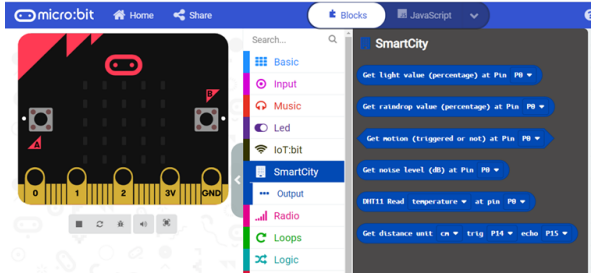
1. Go to https://makecode.microbit.org/ ,
create a new project

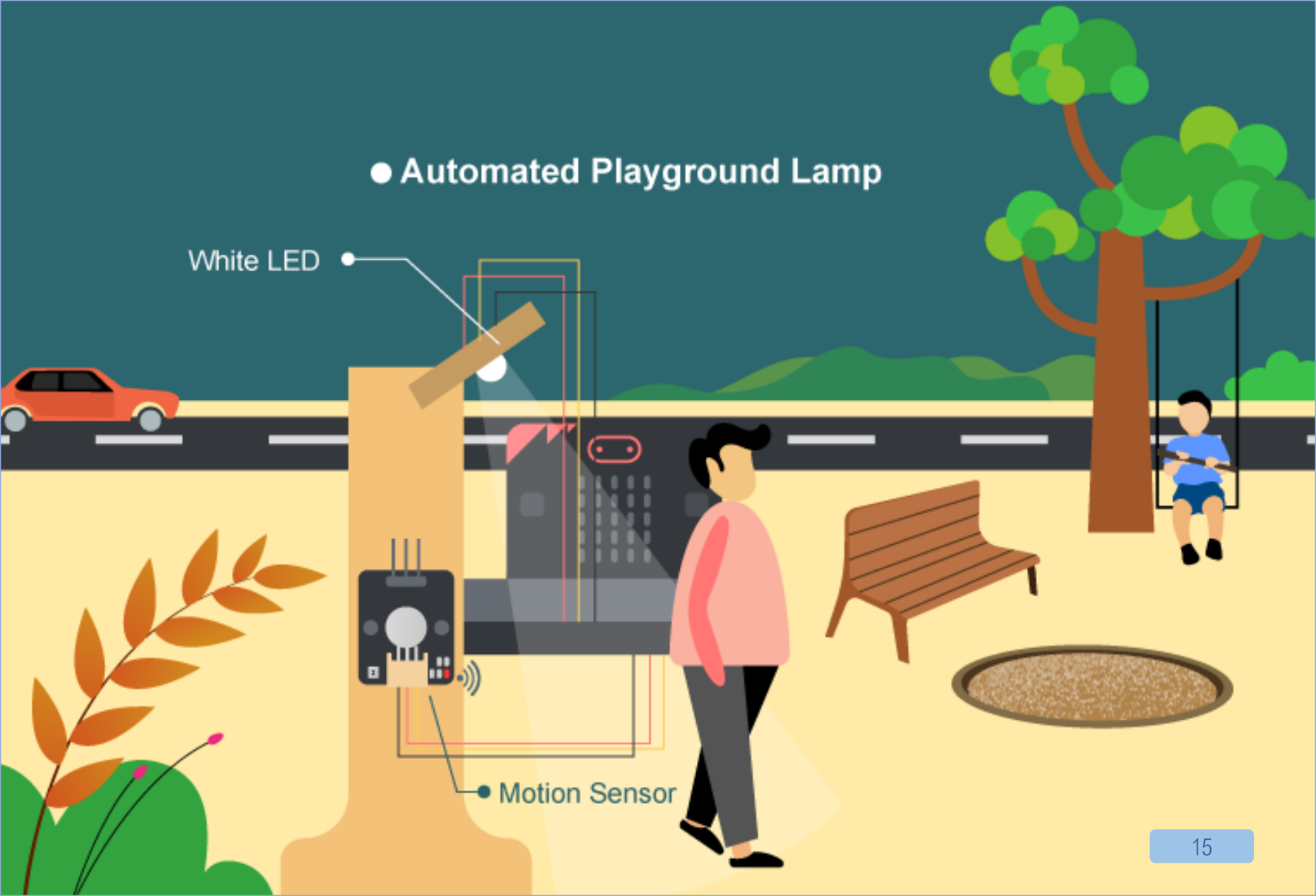


2. Search “https://github.com/smarthon/pxt-smartcity”
and select “smartcity”



3. Once loading completed, SmartCity
will be appeared.

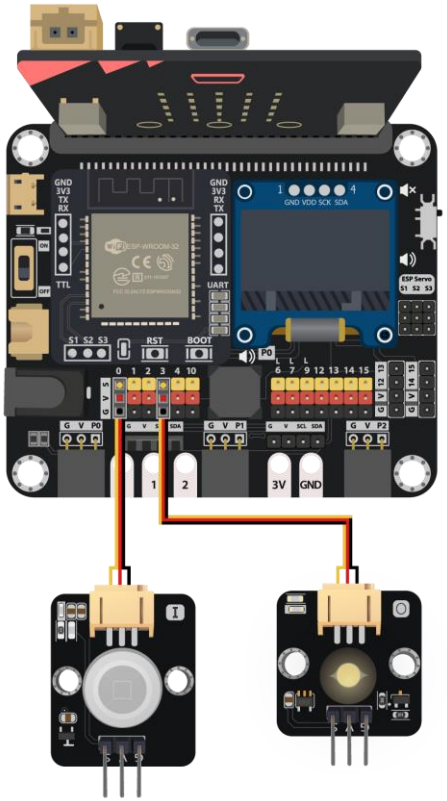



Automated Playground Lamp
White LED
Motion Sensor

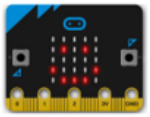
1. AUTOMATED SMART PLAYGROUND LAMP

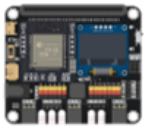
LEVEL: ★ ☆ ☆ ☆ ☆

Introduction
Smart playground lamp is a lamp which can open automatically when someone passes by. Installing an auto-light can help the earth save electricity. When no one passes by, the light will automatically turn off

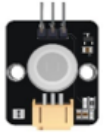


PART LIST


micro:bit (1)


IoT:bit (1)


White LED Light (1)

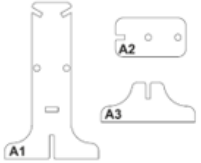

Motion Sensor (1)


3-pin module wire (2)


M4*10mm Screw (4)


M4*10mm Nut (4)

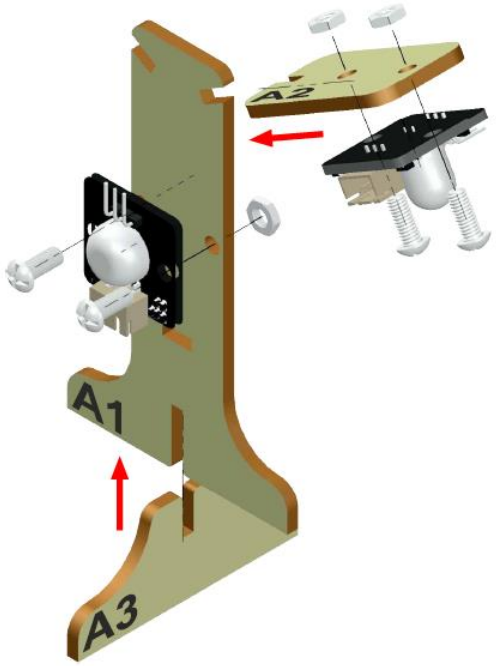

Screwdriver (1)

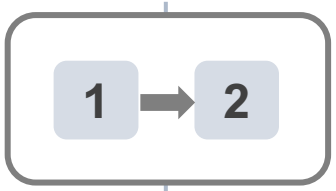


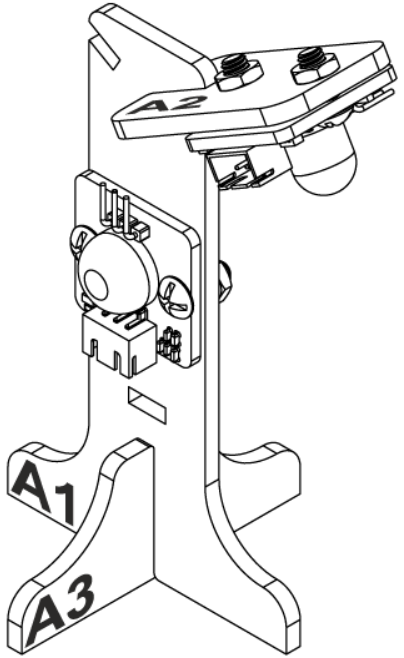
A1-A3 Model (1)

ASSEMBLY STRUCTIONS

A1-A3 model	x1
PIR Motion Sensor	x1
White LED	x1
M4 Nut	x4
M4 x 10mm Screw	x4

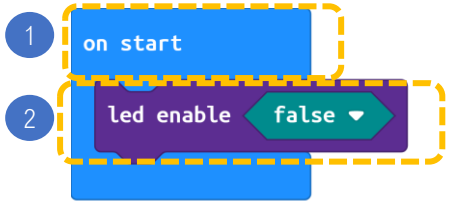


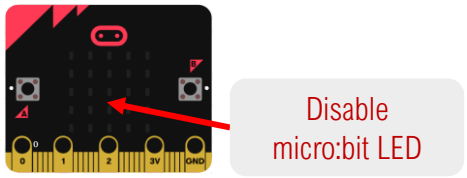


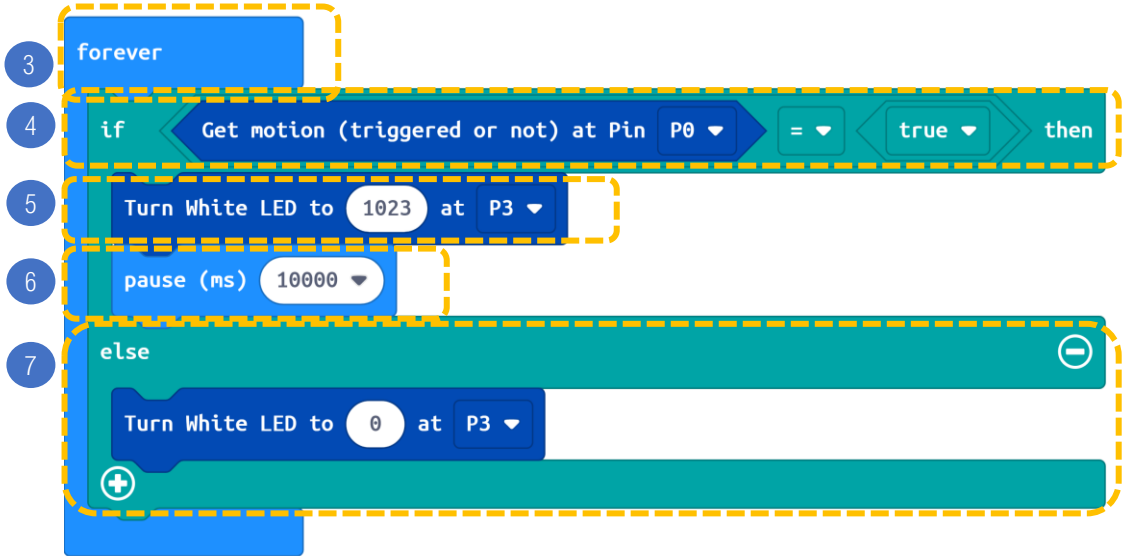


CODING

Other than turning on the light, how can you use with motion sensor? (e.g. people counting)



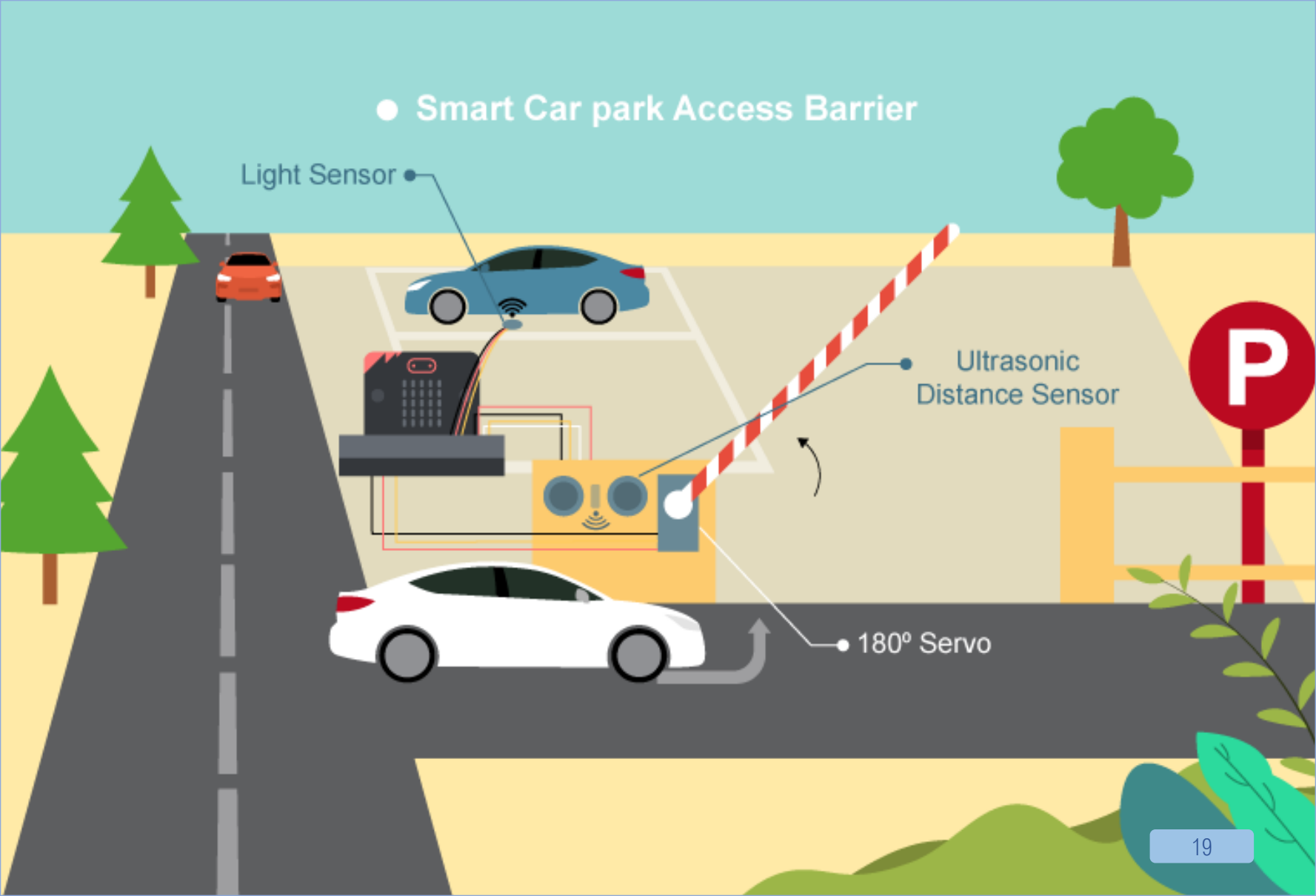




STEPS:

1. Block on start only runs once at the beginning.
2. Led enable is false (as P3 is used for micro:bit LED by default, LED need to be disable before using P3)

3. Block forever runs as a loop.
4. If motion sensor triggered (i.e. someone passes by) is true,
5. White LED light at P3 is turned on.
6. It pauses 10 seconds and the light will up for 10 seconds.
7. White LED light at P3 is set to be turned off.

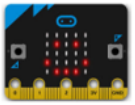

Smart Car park Access Barrier
Light Sensor
Ultrasonic
Distance Sensor
180º Servo
P

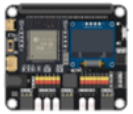
2. SMART CAR PARK ACCESS BARRIER

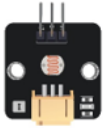
LEVEL: ★ ★ ☆ ☆ ☆

Introduction
Smart Car park Access Barrier is used to allow people to live conveniently. It can reduce manpower and time in controlling the gate and manage information (e.g. car park vacancies). It will be opened automatically if there are vacancies in the car park and there are cars coming in.

PART LIST


micro:bit (1)


IoT:bit (1)


Light Sensor (1)


Distance Sensor (1)


180° Servo (1)


3-pin module wire (1)


4-pin module wire (1)


Servo M2*7.5mm sharp screw (1) (Included in servo pack)


M2*10mm Screw (2)

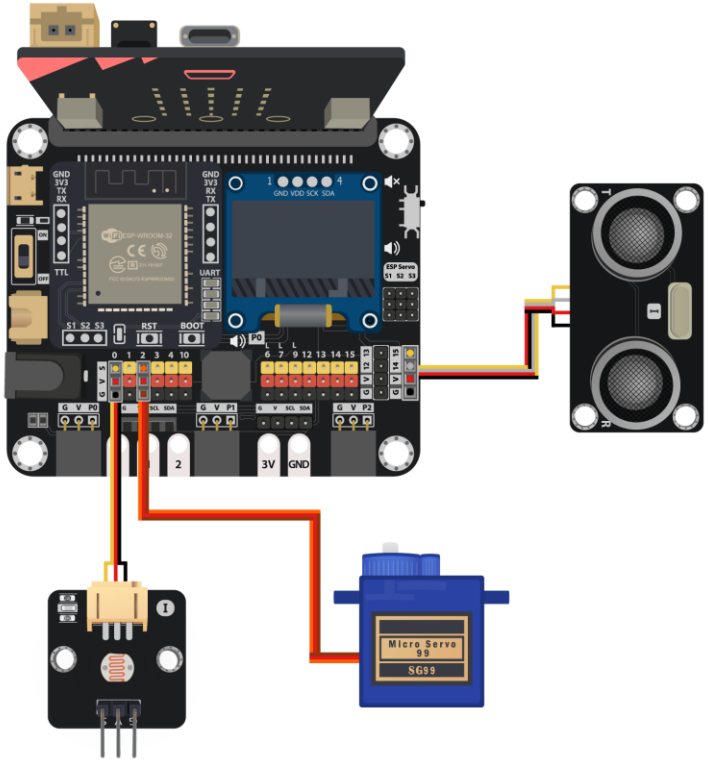

M2 Nut (2)


M4*10mm Screw (4)


M4 Nut (4)

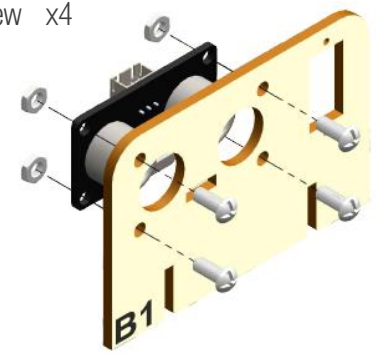

Screwdriver (1)

B1-B3 Model (1)

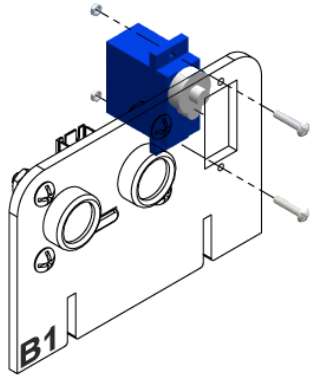


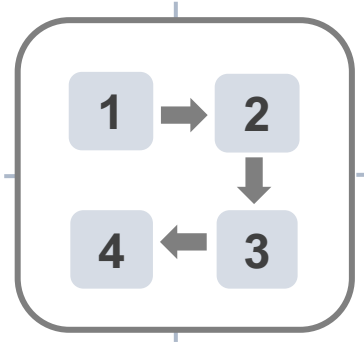
ASSEMBLY STRUCTIONS

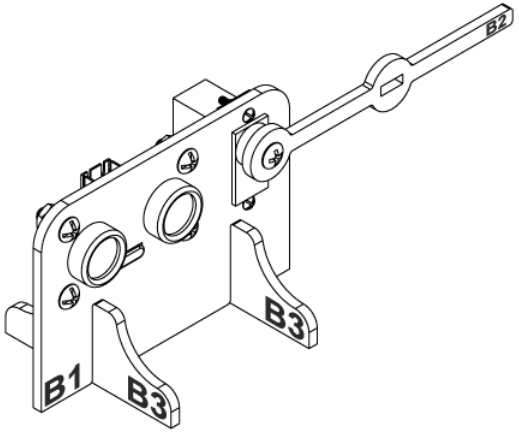
B1 model	x1
Distance Sensor	x1
M4 Nut	x4
M4*10mm Screw	x4

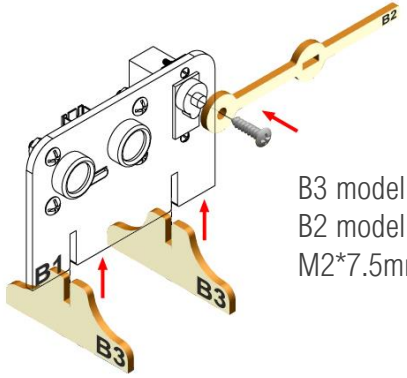


180º servo	X1
M2 Nut	X2
M2*10mm Screw	X2





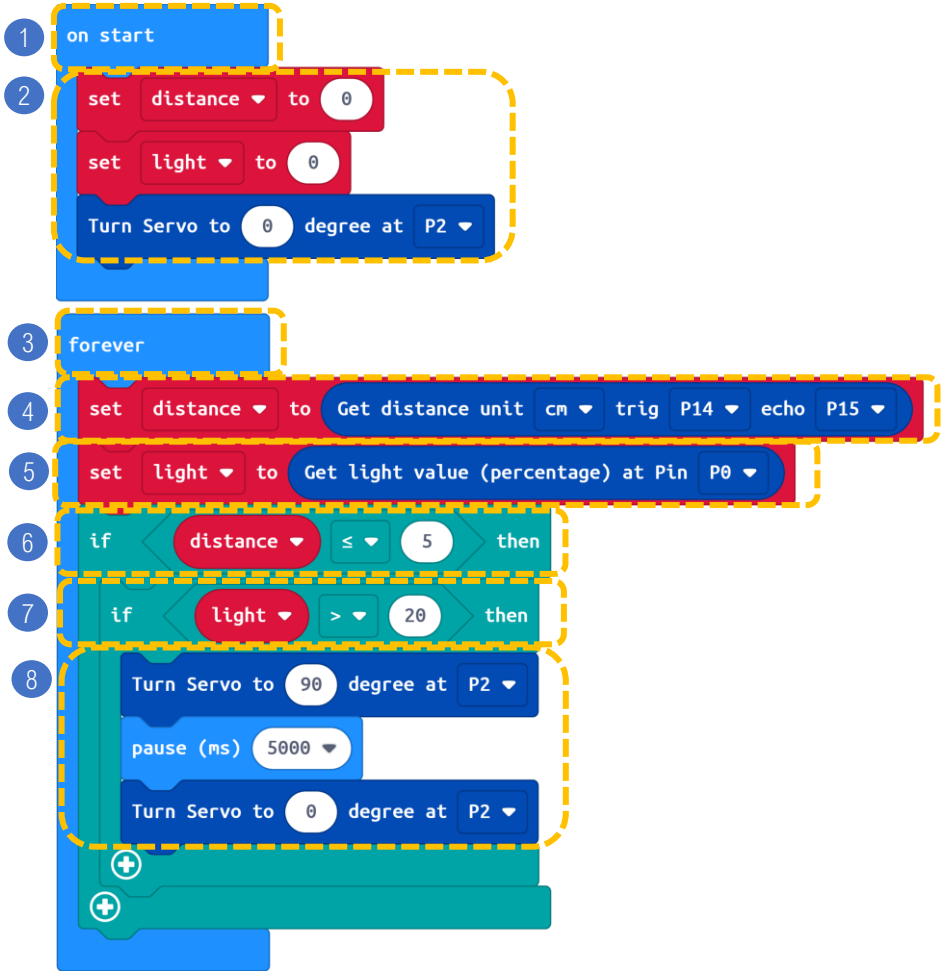




B3 model	X2
B2 model	X1
M2*7.5mm Sharp Screw	X1

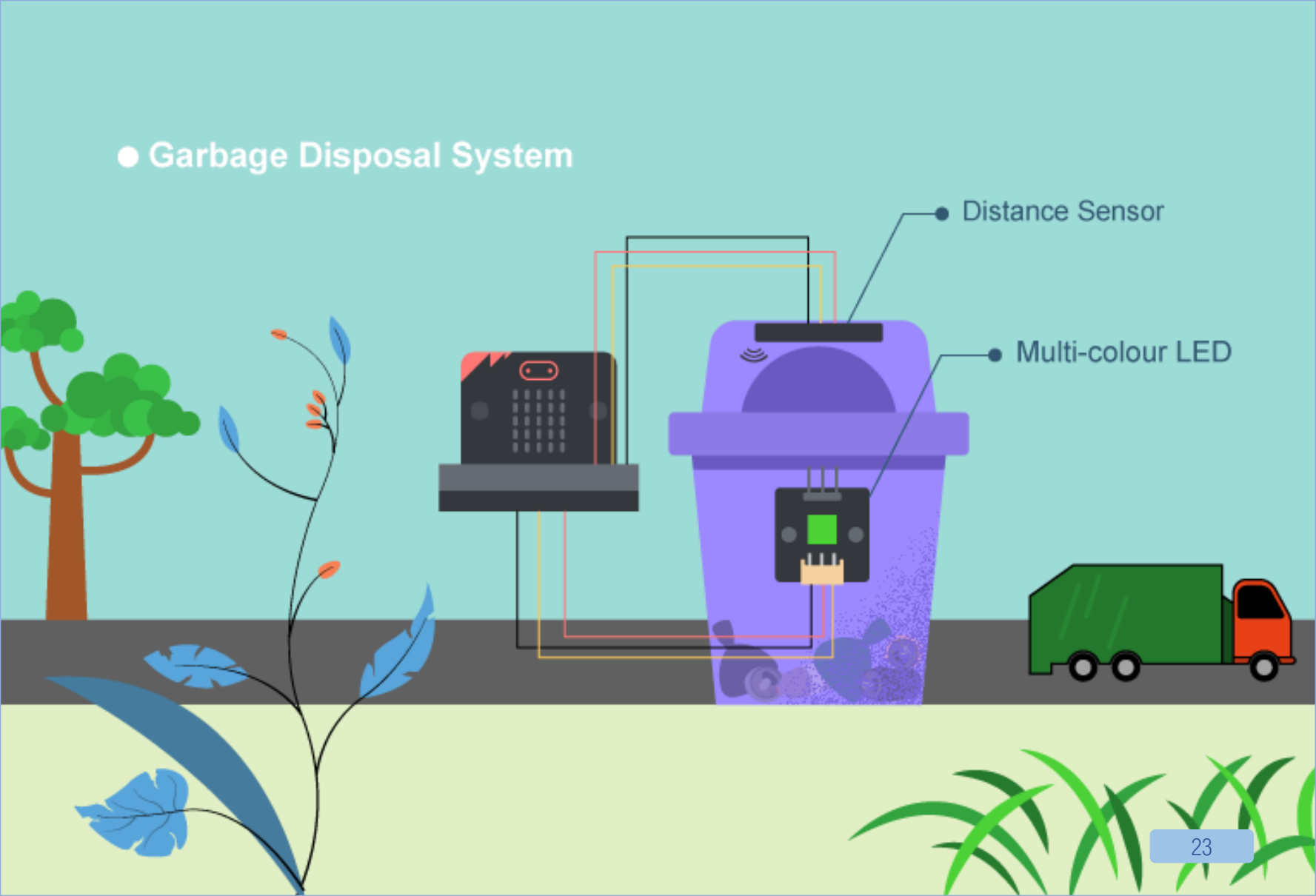
CODING

How can you show the light and distance value on OLED?



STEPS:

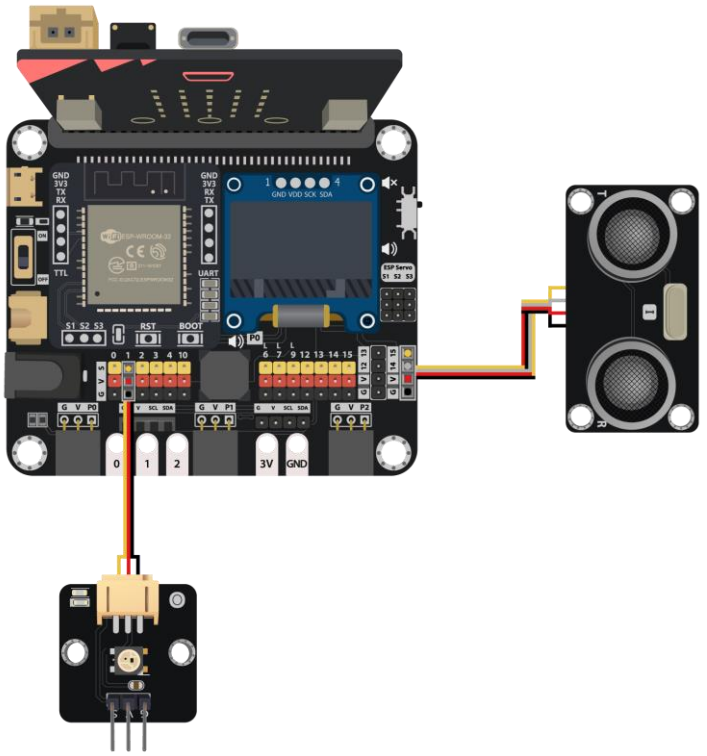
1. Block on start only runs once at the beginning.
2. Set distance and light to 0 and turn servo at P2 to 0 degree.
3. Block forever runs as a loop.
4. Set distance to get value from the distance sensor connected to P14 and P15
5. Set light to get light value from the light sensor at P0.
6. If there is car coming near (distance ≤ 5) then,
7. If there is vacancy inside the car part (light value > 20),
8. Car park gate is opened (i.e. servo is turned for 90º). It pauses 5 seconds and the gate will open for 5 seconds. Then the car park gate is closed (i.e. servo is returned to 0º).


Garbage Disposal System
Distance Sensor
Multi-colour LED

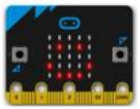
3. GARBAGE DISPOSAL SYSTEM

LEVEL: ★ ★ ☆ ☆ ☆

Introduction
LED light on the garbage bin can show people the amount of garbage inside the garbage bin so that garbage truck can easily determine if the garbage is full or not. This can minimize the wastage of the garbage bags and become a more environmental-friendly city.



PART LIST


micro:bit (1)


IoT:bit (1)


Multi-colour LED (WS2812) (1)


Distance Sensor (1)

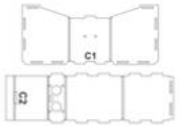

3-pin module wire (1)


4-pin module wire (1)


M4*10mm Screw (6)


M4 Nut (6)

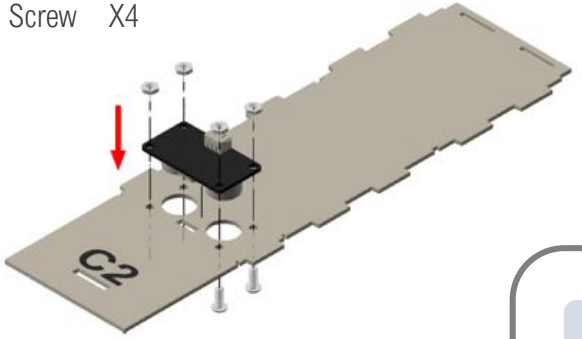

Screwdriver (1)



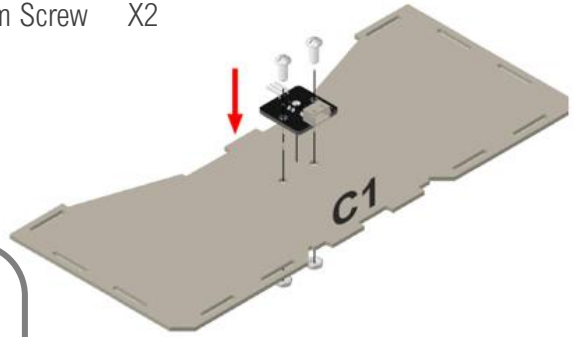
C1-C2 Model (1)

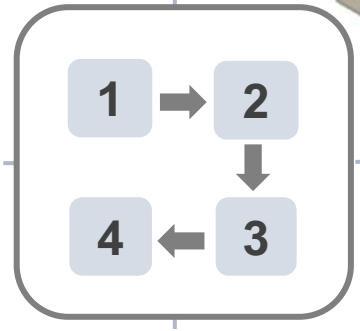
ASSEMBLY STRUCTIONS

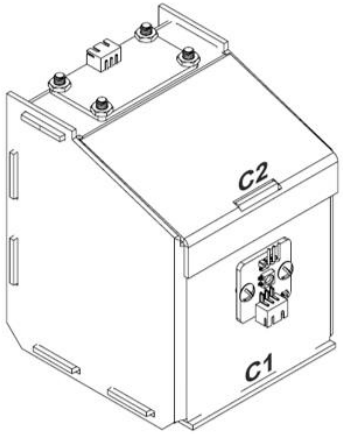
C2 model X1
Distance sensor X1
M4 Nut X4
M4*10mm Screw X4

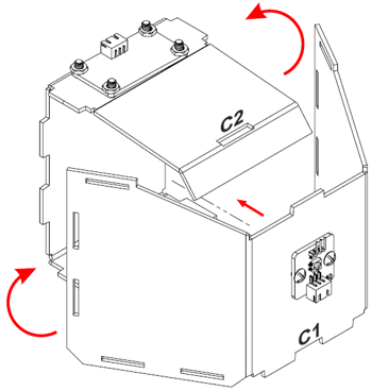


C1 model X1
Multi-colour LED X1
M4 Nut X2
M4*10mm Screw X2



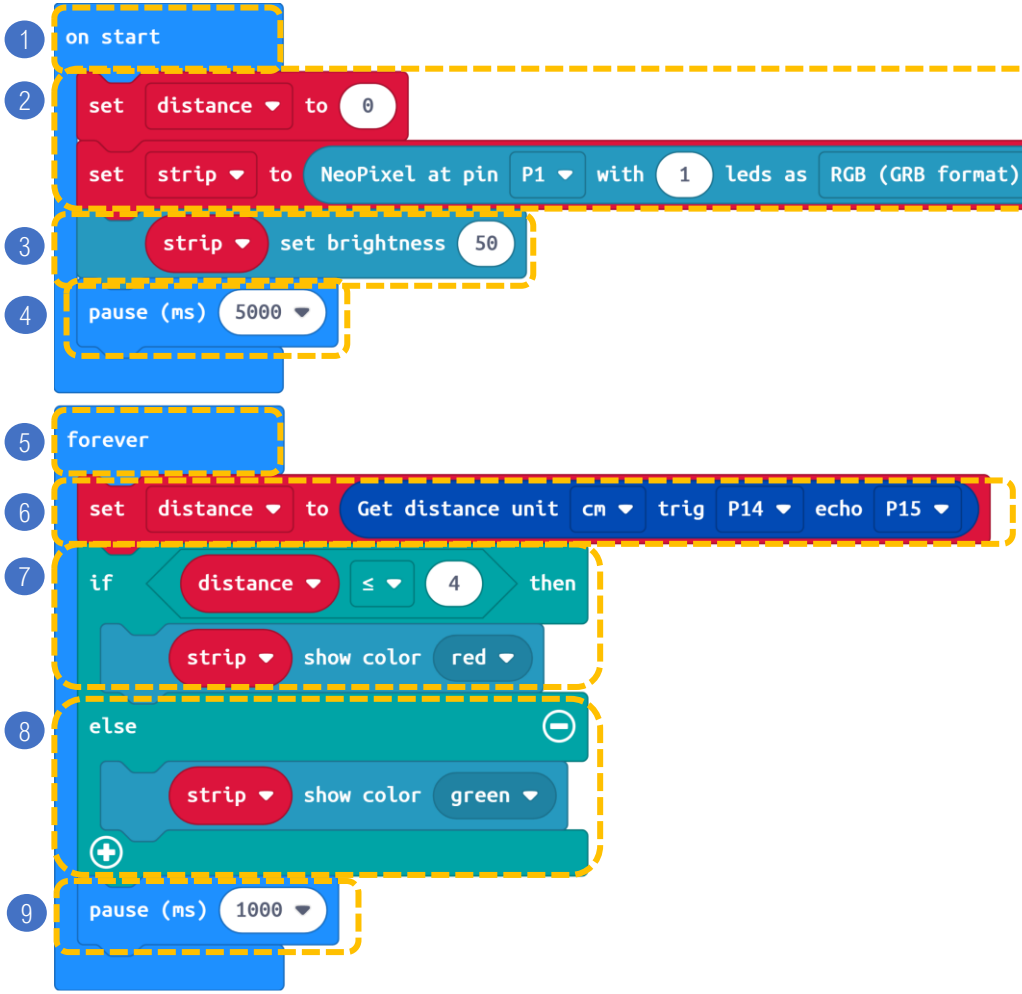






CODING

How to make sound notification if there are full of garbage (e.g. using buzzer)?

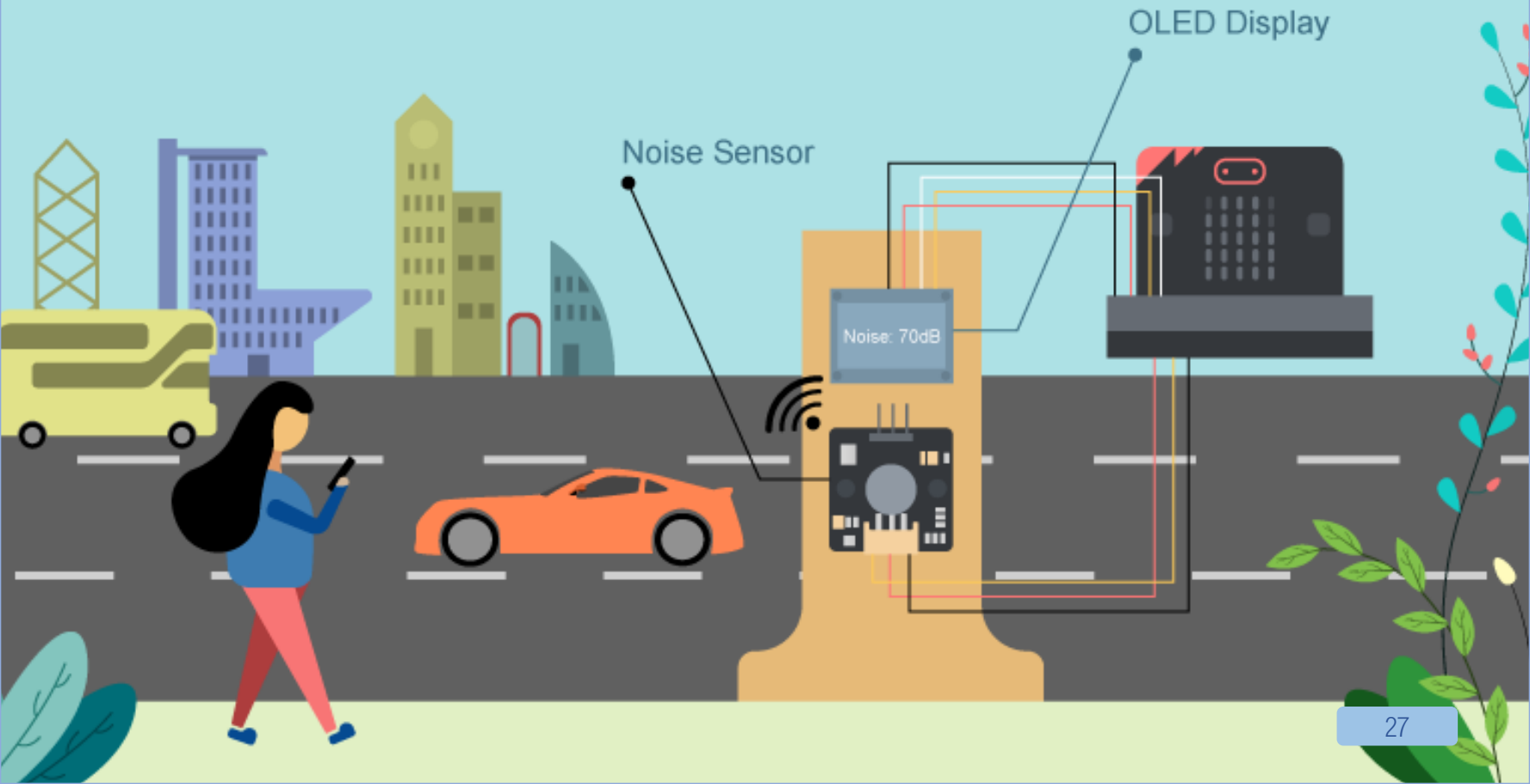


STEPS:

1. Block on start only runs once at the beginning.
2. Set distance to 0 and set strip to NeoPixel at pin P1 with 1 leds as RGB (GRB format)
3. Strip set brightness to 50
4. Pause for 5 seconds.

5. Block forever runs as a loop.
6. Set distance to get distance unit cm trig P14 echo P15.
7. If distance ≤ 4 then, strip show colour red.
8. Else, strip show colour green.
9. Pause 1 second for the corresponding colour lighting up.

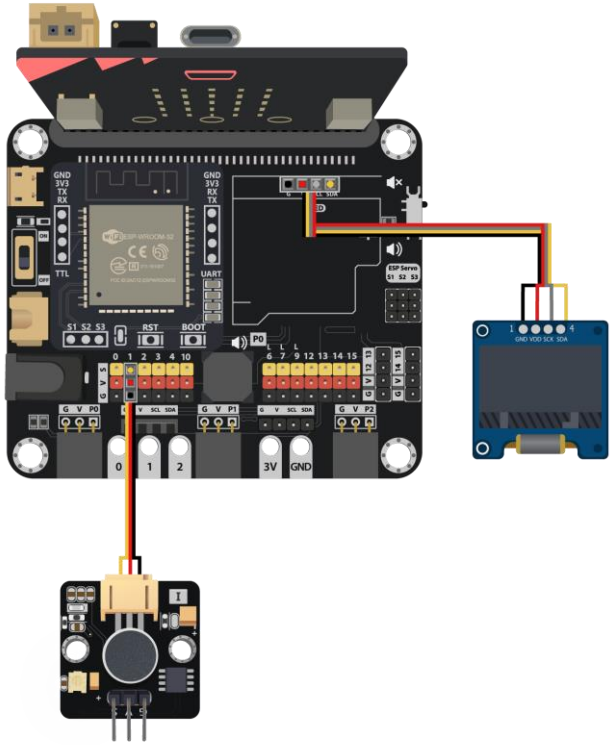
- Urban noise detection



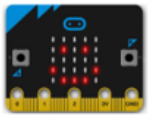
4. URBAN NOISE DETECTION

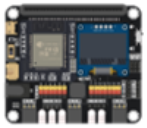
LEVEL: ★ ★ ☆ ☆ ☆

Introduction
It is a system to detect noise near the road as noise pollution caused by cars on the road seriously affect the living standard of people. By installing a monitor to detect the noise volume near the roadside can help engineer to gather noise information and find solution to solve the problem in the future.



PART LIST


micro:bit (1)


IoT:bit with OLED (1)


Noise Sensor (1)


3-pin module wire (1)


4-pin extension wire (1)

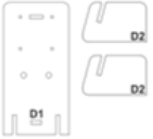

M2*10mm Screw (2)


M2 Nut (2)


M4*10mm Screw (4)


M4 Nut (4)

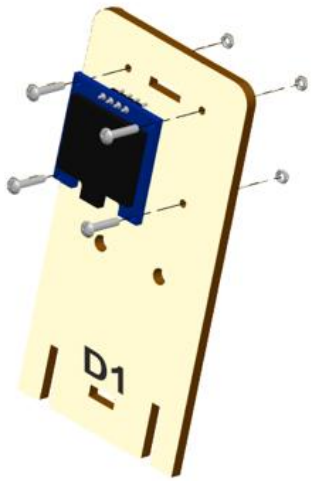

Screwdriver (1)



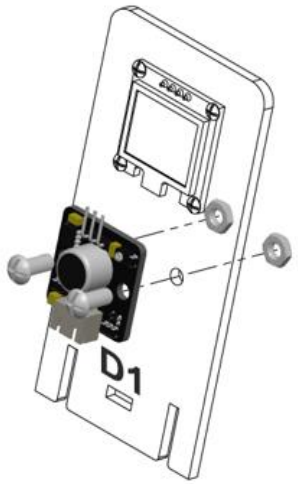
D1-D2 Model (1)

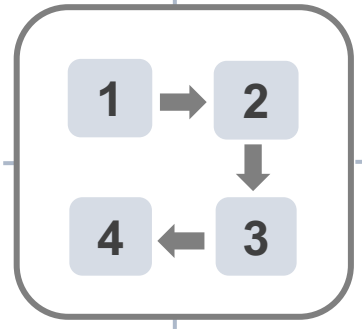
ASSEMBLY STRUCTIONS

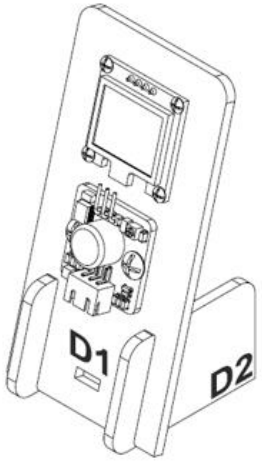
D1 model X1
OLED X1
M2 Nut X4
M2*10mm screw X4

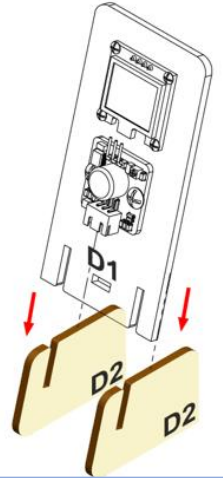


Noise sensor X1
M4 Nut X2
M4*10mm screw X2





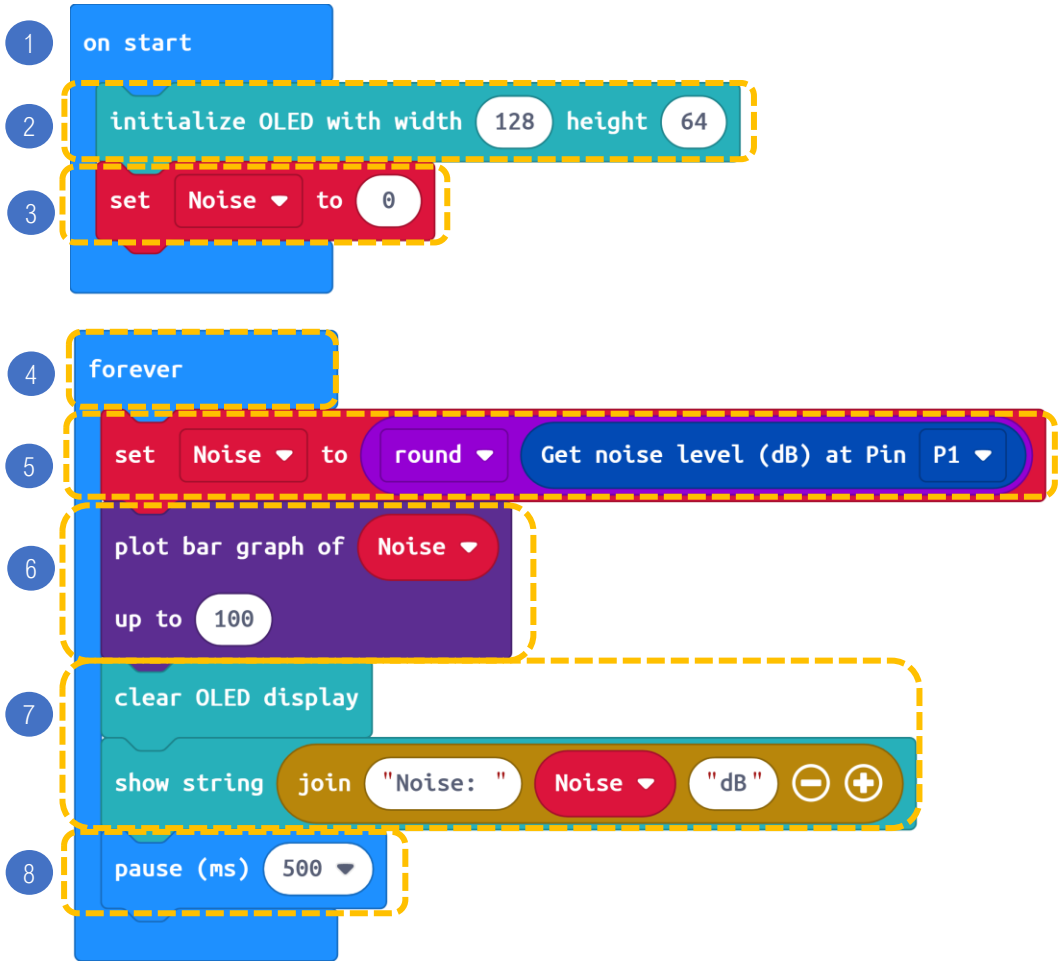




D2 model X2

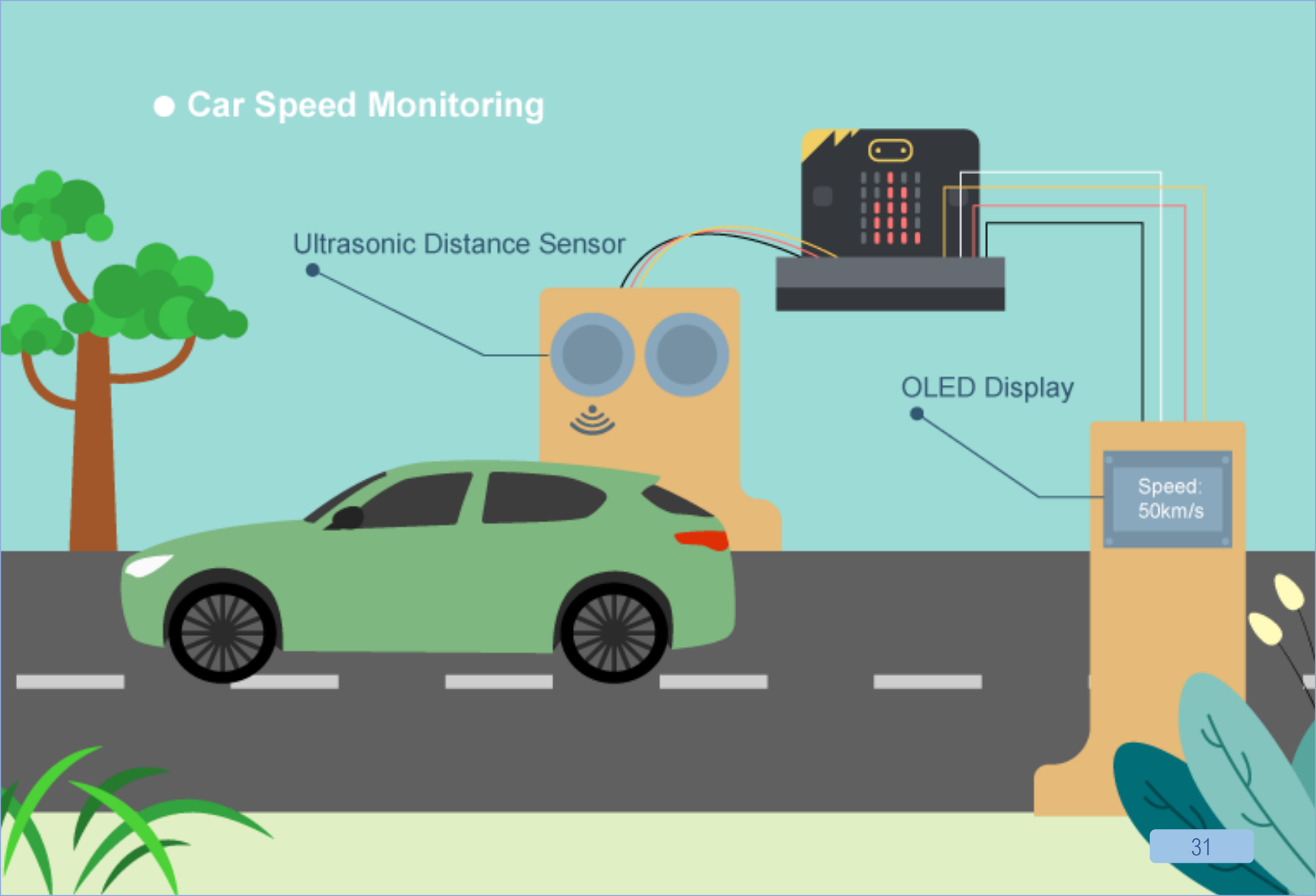
CODING

How to make a notification if noise pollution problem is serious? e.g. showing red LED



STEPS:

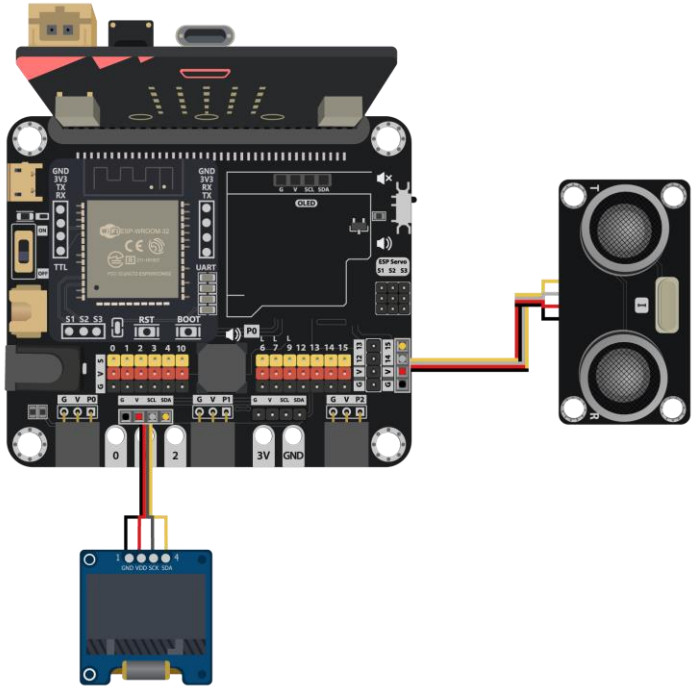
1. Block on start only runs once at the beginning.
2. Initialize OLED with width:128, height: 64
3. Set noise to 0
4. Block forever runs as a loop.
5. Set noise to round get noise level (dB) at Pin P1
6. Plot bar graph of noise on the micro:bit LED.
7. Clear OLED display, then show string text “Noise:” & noise level & text “dB:” on the OLED.
8. Pause 0.5 second for the corresponding noise bar graph shown.


Car Speed Monitoring
Ultrasonic Distance Sensor
OLED Display
Speed:
50km/s

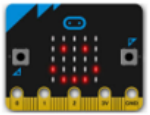
5. CAR SPEED MONITORING

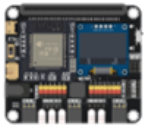
LEVEL: ★ ★ ★ ☆ ☆

Introduction
It is an automatic system to check car speed on the road at certain time interval. There are cars often over-speed causing traffic accidents, therefore installing a car speed monitoring is a must to minimize the chances of traffic accidents.



PART LIST


micro:bit (1)


IoT:bit with OLED (1)


Distance Sensor (1)


4-pin module wire (1)


4-pin extension wire (1)

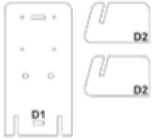

M2*10mm Screw (4)


M2 Nut (4)


M4*10mm Screw (4)


M4 Nut (4)


Screwdriver (1)

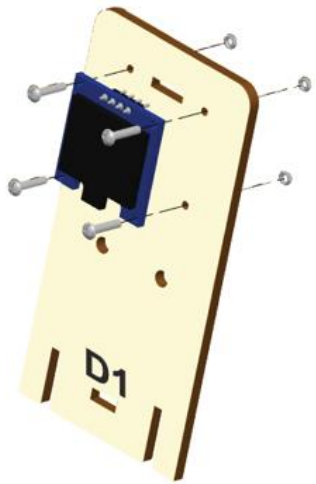


D1-D2 Model (1)

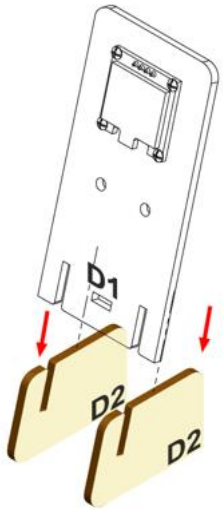
E1-E2 Model (1)

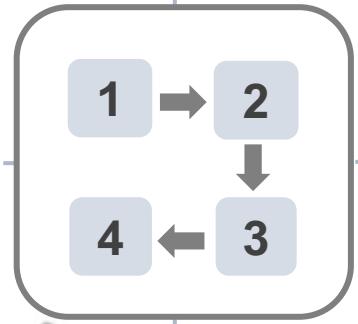
ASSEMBLY STRUCTIONS

D1 model X1
OLED X1
M2 Nut X4
M2 *10mm screw X4

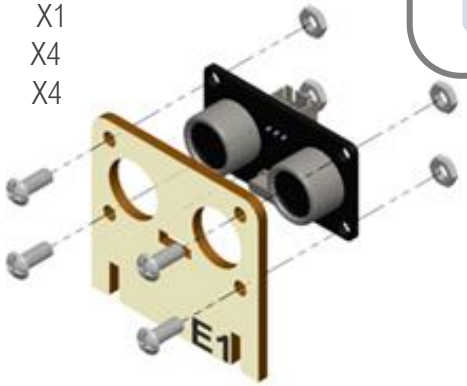


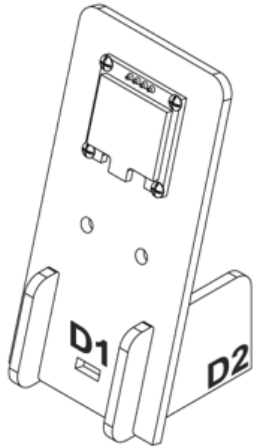
D2 model X2





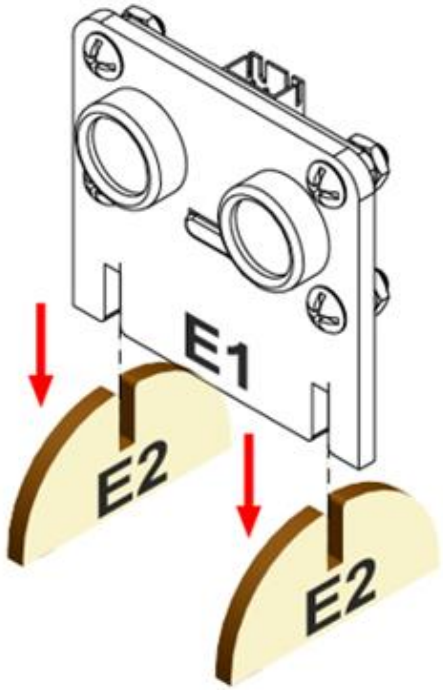
E1 model X1
Distance sensor X1
M4 Nut X4
M4 *10mm Screw X4



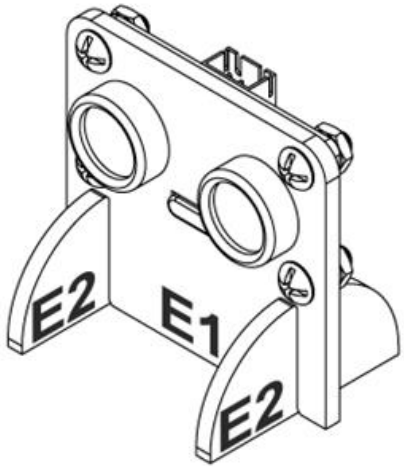


ASSEMBLY STRUCTIONS

E2 model X2

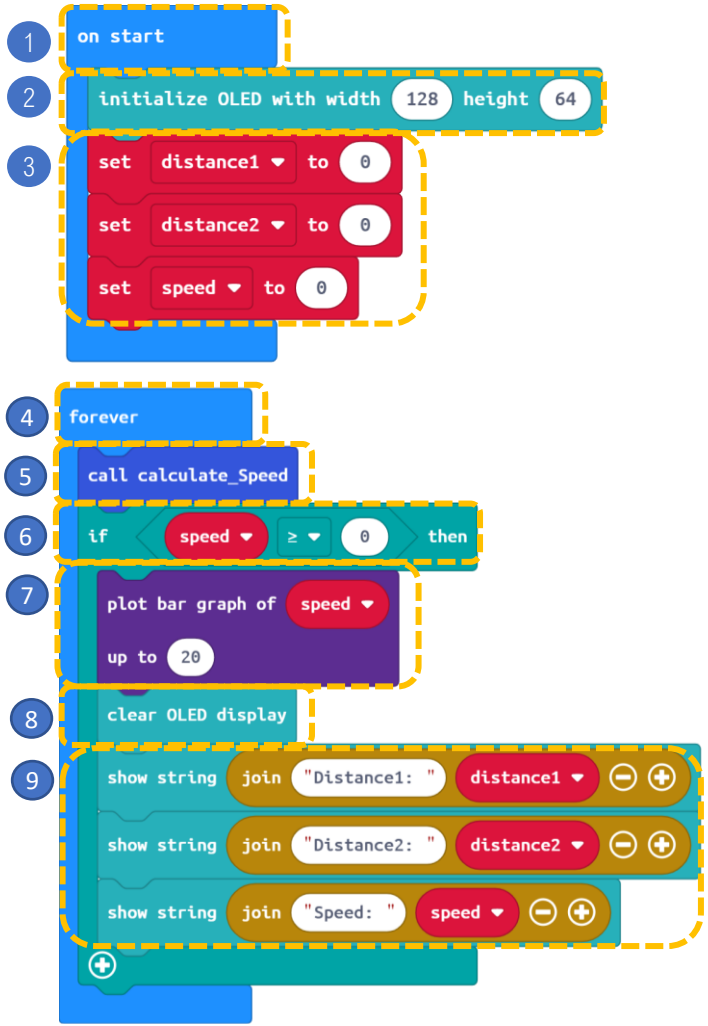


5 → 6



CODING

How can we set a sound alert to notify that there is car over-speeding?

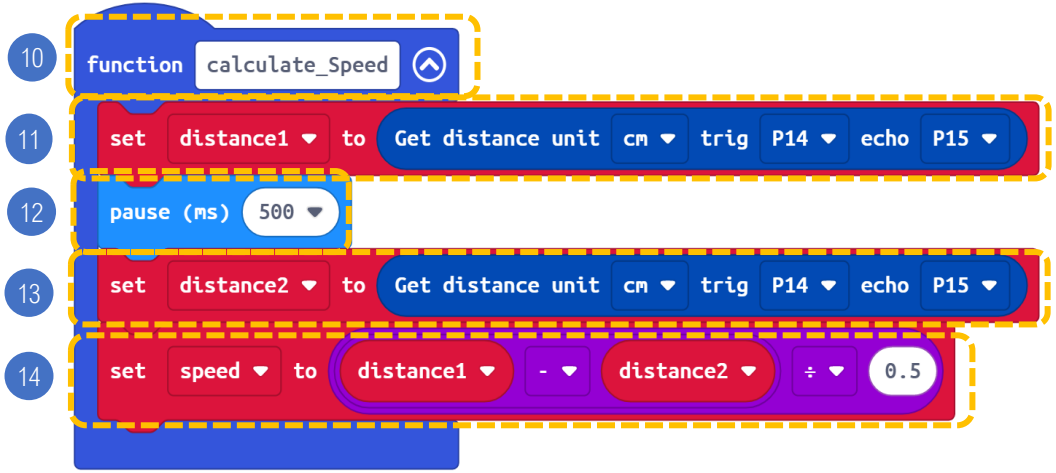


STEPS:

1. Block on start only runs once at the beginning.
2. Initialize OLED with width:128, height:64
3. Set distance 1, distance 2 and speed to 0.
4. Block forever runs as a loop.
5. Call function calculateSpeed (it will calculate distance1, distance2 and the speed)
6. If there is car coming near (speed ≥ 0) then,
7. Plot bar graph of speed on the micro:bit LED.
8. Clear OLED display
9. Show string text “Distance1:” & distance 1, text “Distance2:” & distance2 and text “Speed:” & speed on the OLED.

CODING

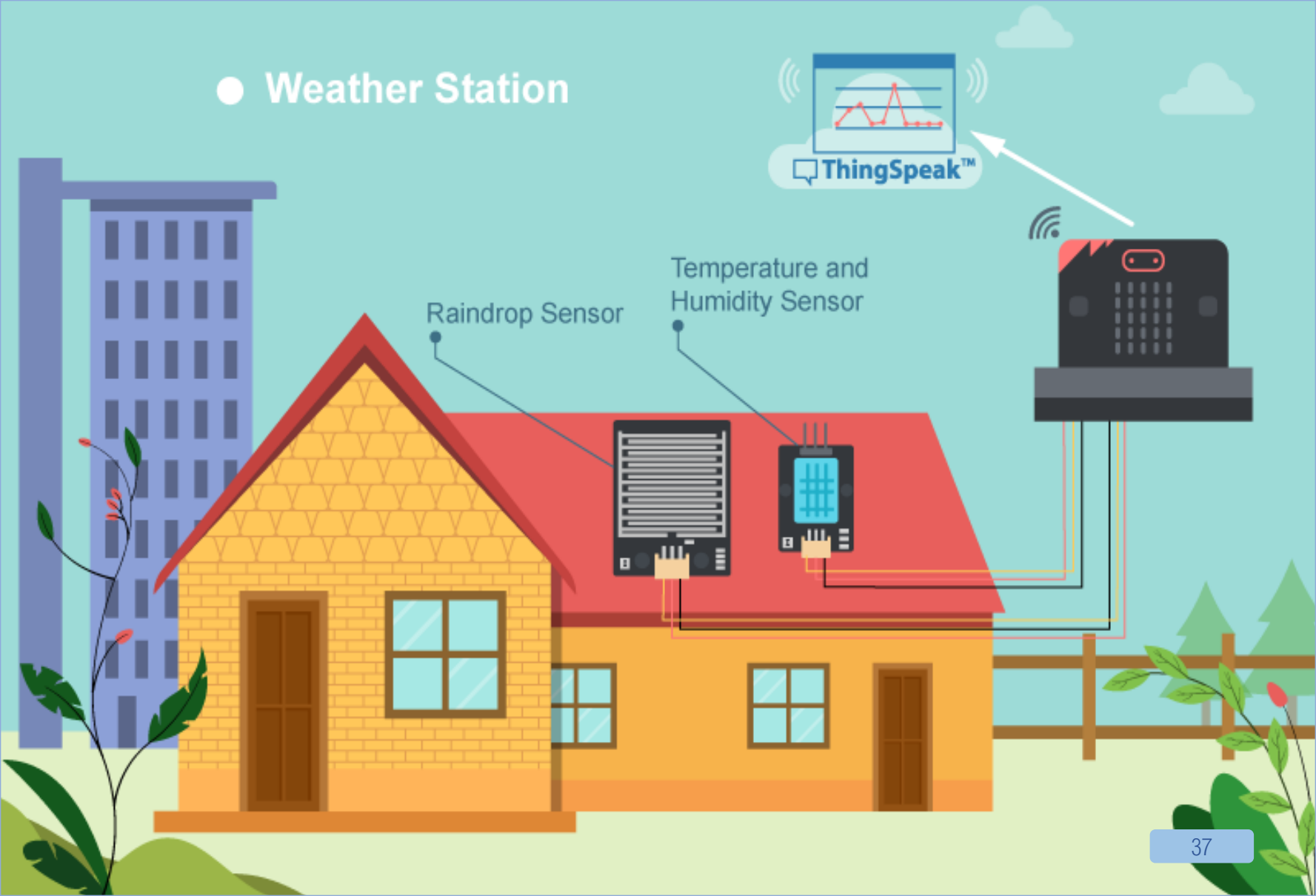
How can we set a sound alert to notify that there is car over-speeding?



STEPS:

10. Set function (calculate_Speed)
11. Set distance 1 to get distance from the distance sensor connected to P14 and P15.
12. Pause 0.5 second for the checking the next distance
13. Set distance 2 to get distance from the distance sensor connected to P14 and P15.
14. Set speed to (distance1 – distance2) / 0.5.

Weather Station

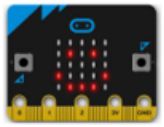


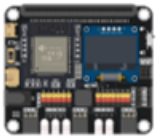
6. [IOT] WEATHER STATION

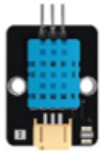
LEVEL: ★ ★ ☆ ☆ ☆

Introduction
Collecting temperature, humidity and raindrop consistently and uploading the data by using Thingspeak. This can help us to do analytical work more conveniently as we can refer to the automatically plotted graphs.

PART LIST


micro:bit (1)


IoT:bit with OLED (1)


Temperature and humidity Sensor (1)


Raindrop Sensor (1)


3-pin module wire (2)

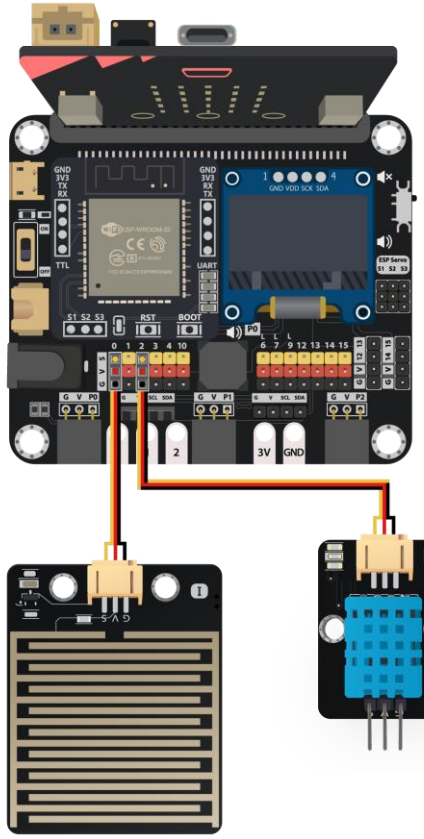

M4*10mm Screw (4)


M4 Nut (4)


Screwdriver (1)

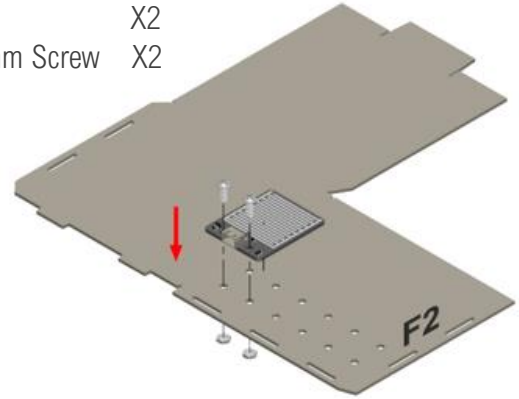

F1-F2 Model (1)

ThingSpeak

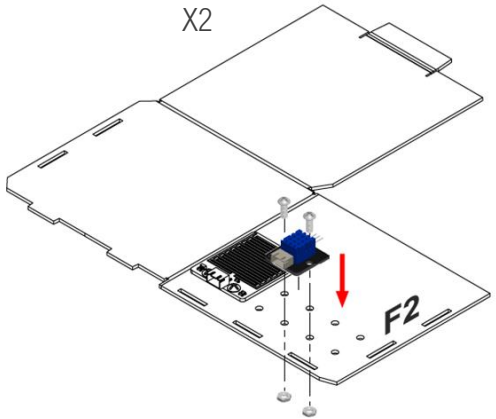


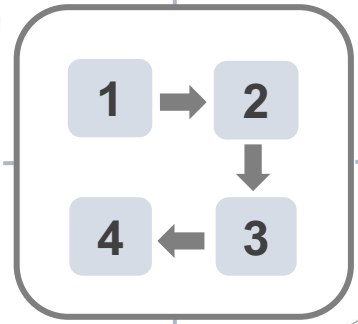
ASSEMBLY STRUCTIONS

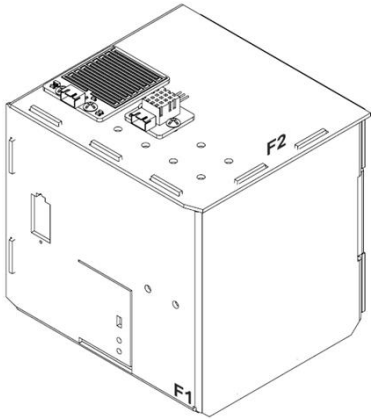
F2 model X1
Raindrop sensor X1
M4 Nut X2
M4*10mm Screw X2

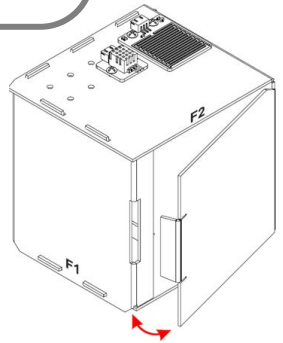


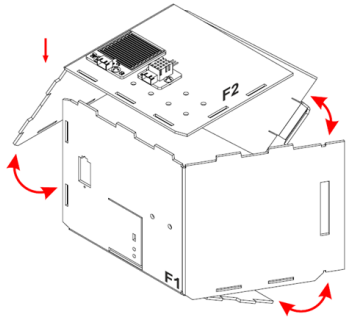
Temperature and humidity sensor X1
M4 Nut X2
M4*10mm Screw X2







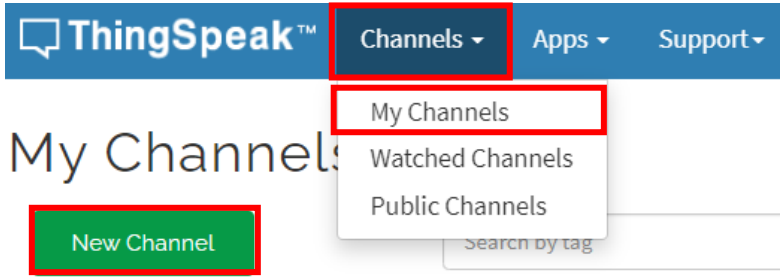




F1 model X1

IOT – THINGSPEAK

Step 1. Go to https://thingspeak.com/ , Choose Channels -> My Channels -> New Channel



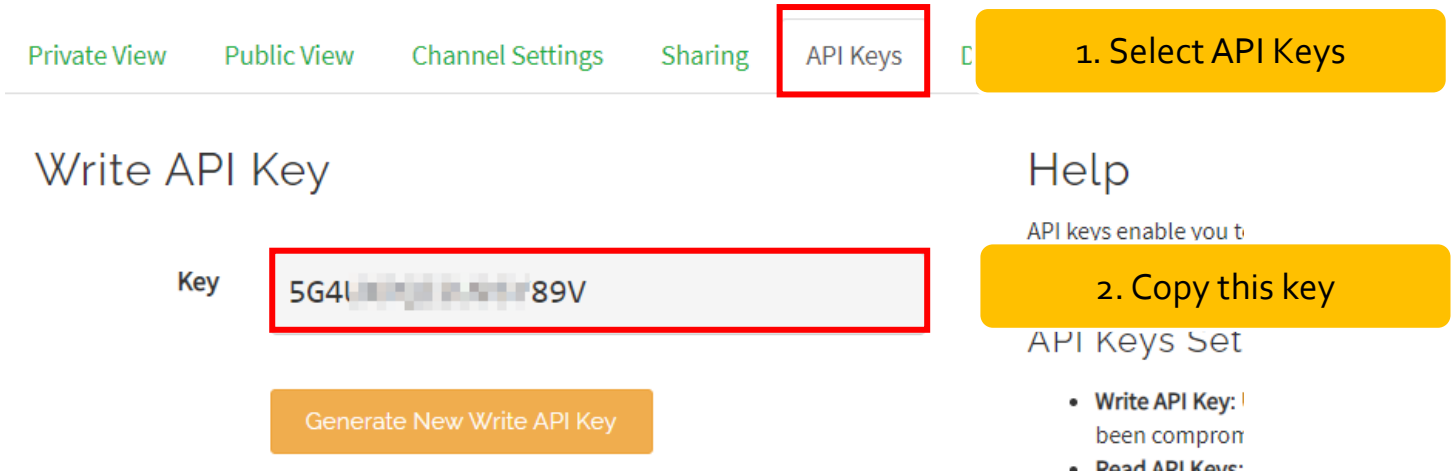
Step 2. Input Channel name, Field1 and Field2 , then click “Save Channel”

- Channel name: Smart Weather Station
- Field 1: temperature
- Field 2: humidity
- Freld 3: raindrop

https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter1.html

IOT – THINGSPEAK

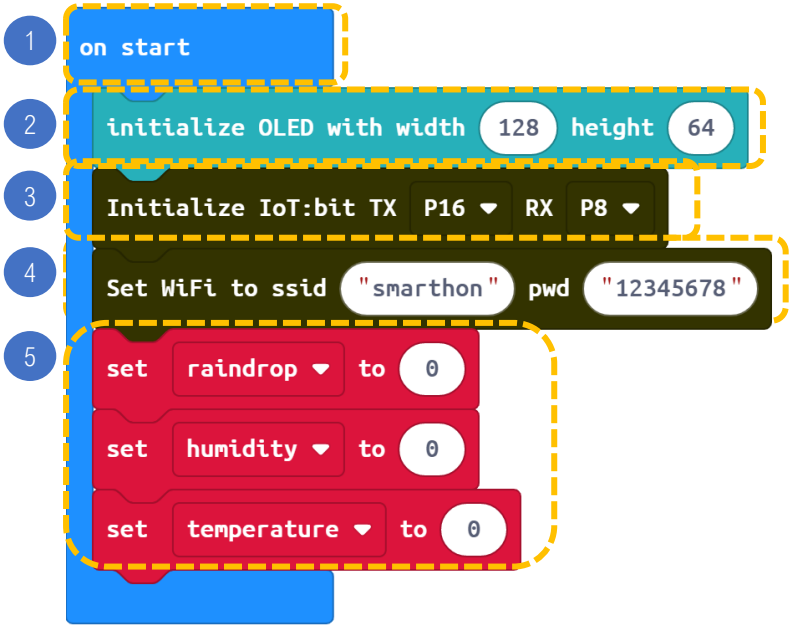
Step 3. Select your channel > “API Keys”, copy the write API key as follows:

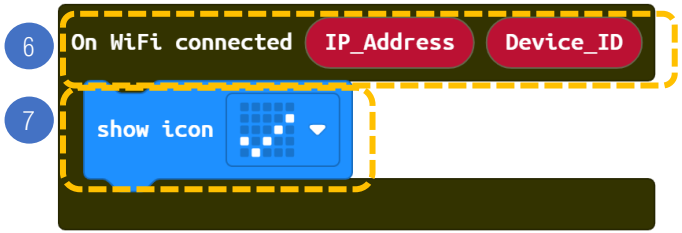


https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter1.html

CODING

How can we upload other module values (e.g. noise) to ThingSpeak?



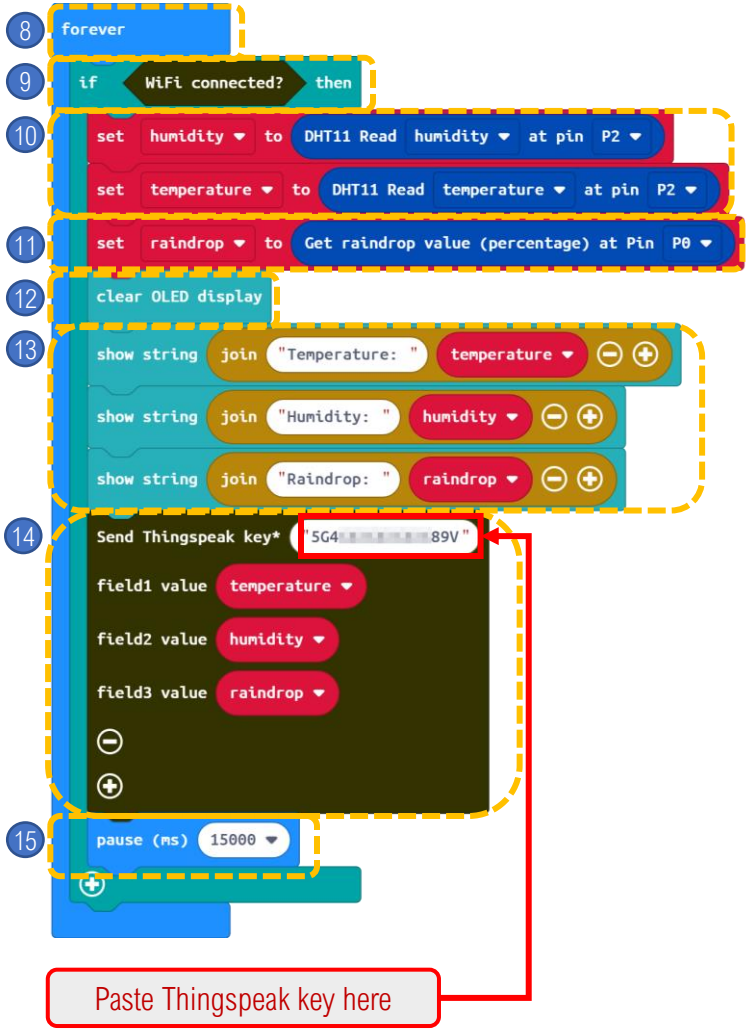


STEPS:

1. Block on start only runs once at the beginning.
2. Initialize OLED with width:128, height:64
3. Initialize IoT:bit at P16 and P8
4. Set WiFi connection by entering WiFi name and password.
5. Set temperature, humidity and raindrop to 0.
6. When WiFi is connected
7. Micro:bit LED will show icon “tick”

CODING

How can we upload other module values (e.g. noise) to ThingSpeak?

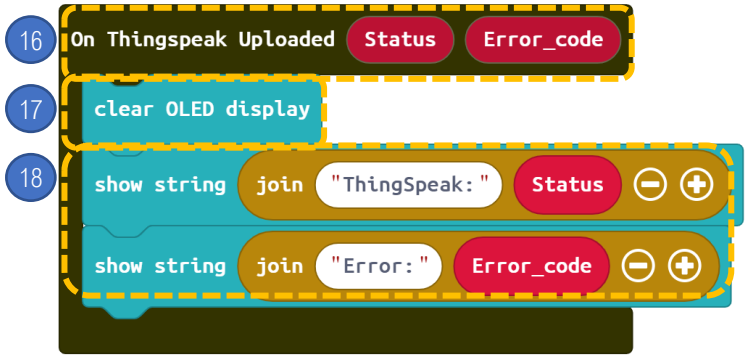


STEPS:

8. Block forever runs as a loop.
9. Set if WiFi is connected then
10. Set humidity and temperature to get reading from the DHT11 connected to P2.
11. Set raindrop to get reading from the raindrop sensor connected to P0.
12. Clear OLED display
13. Show string text "Temperature" & temperature, text "Humidity" & humidity and text "Raindrop:" & raindrop on the OLED.
14. Send data to Thingspeak.
15. Pause 15 seconds.

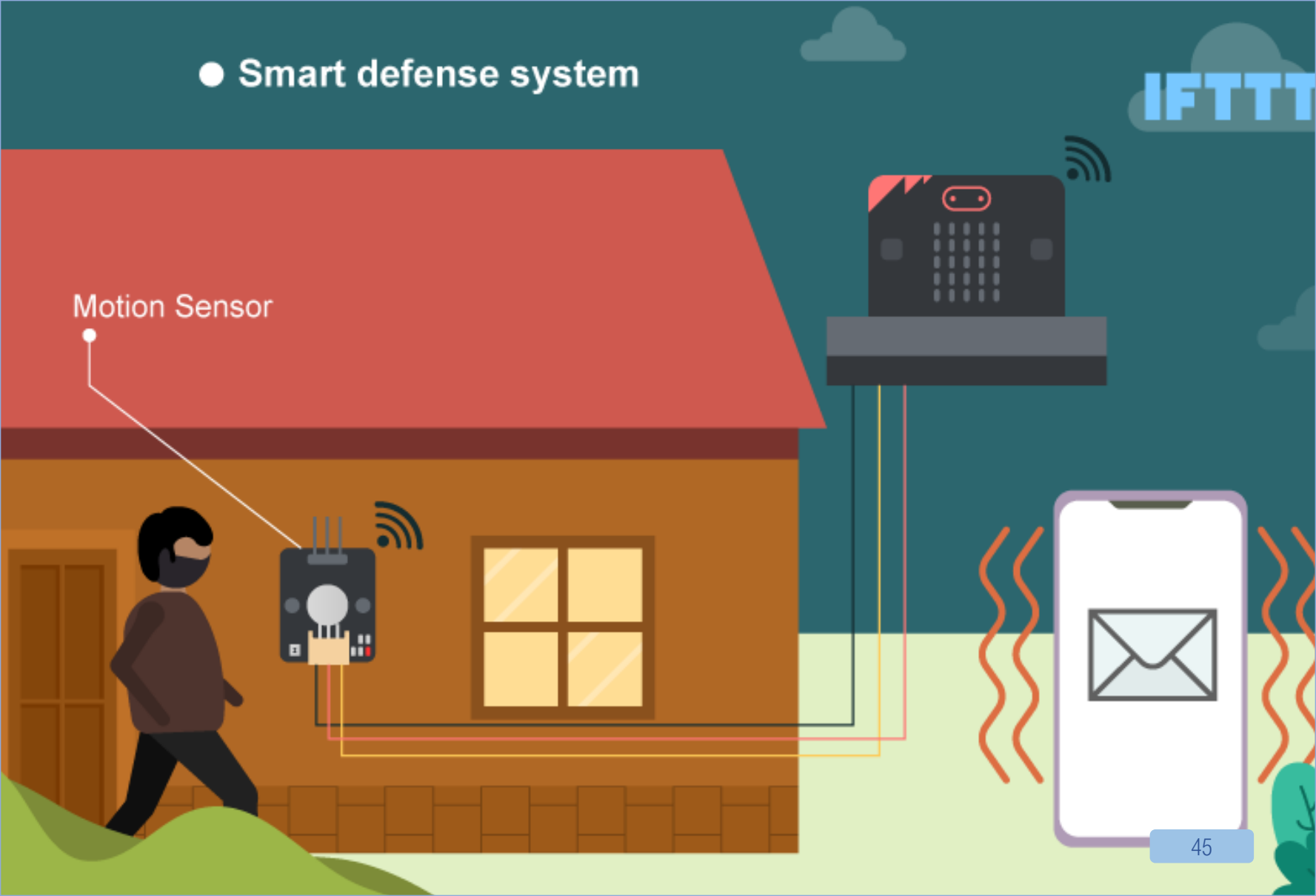
CODING

How can we upload other module values (e.g. noise) to ThingSpeak?



STEPS:

16. When Thingspeak uploaded
17. Clear OLED display
18. Show string text “ThingSpeak:”& status and text “Error:” & error code on the OLED.

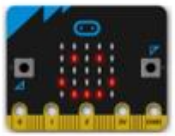

Smart defense system
IFTTT
Motion Sensor

7. [IOT] SMART DEFENSE SYSTEM

LEVEL: ★ ★ ★ ☆ ☆

Introduction
The motion sensor can deliver a motion signal to the micro:bit. When the micro:bit detects the signal, the buzzer will emit sound and send an email to specific email account through IFTTT. Also, a monster icon will be shown on the micro:bit if there are suspicious people passes by.

PART LIST


micro:bit (1)


IoT:bit with OLED (1)


Motion Sensor (1)


3-pin module wire (1)

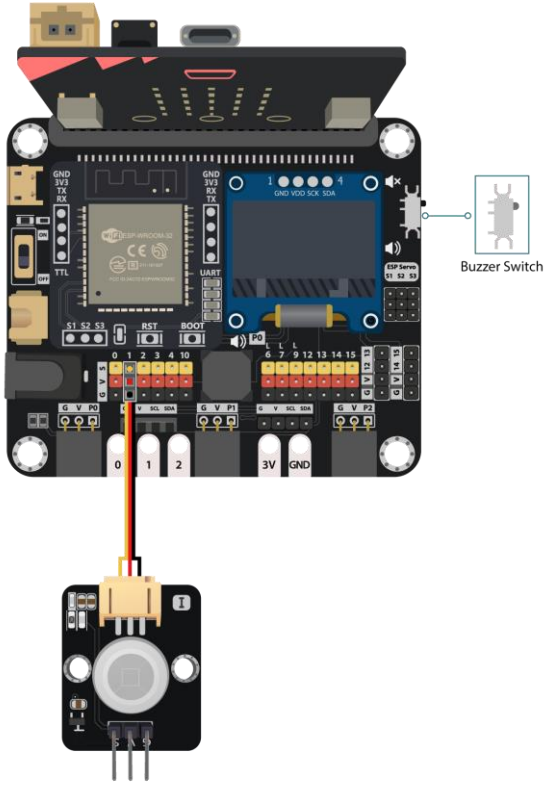

M4*10mm Screw (2)


M4 Nut (2)


Screwdriver (1)

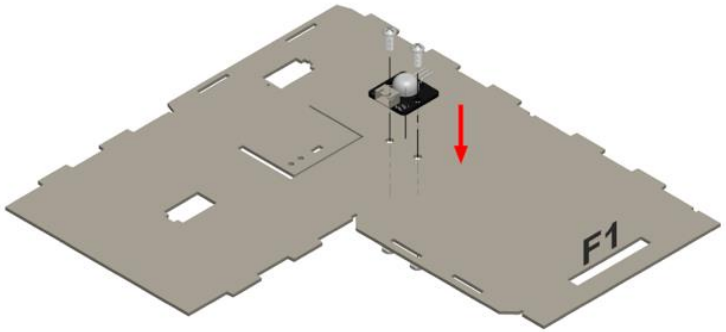

F1-F2 Model (1)

IFTTT

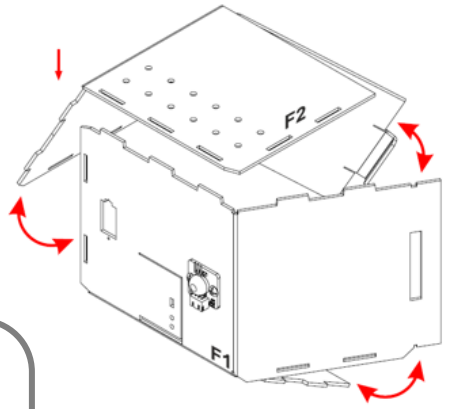


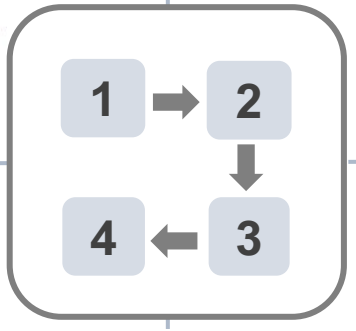
ASSEMBLY STRUCTIONS

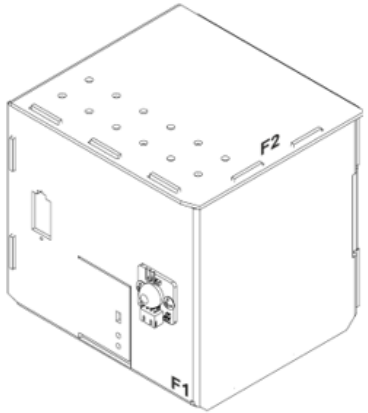
F1 model X1
Motion sensor X1
M4 Nut X2
M4*10mm Screw X2



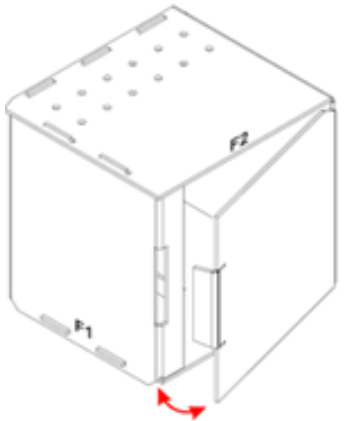
F2 model X1







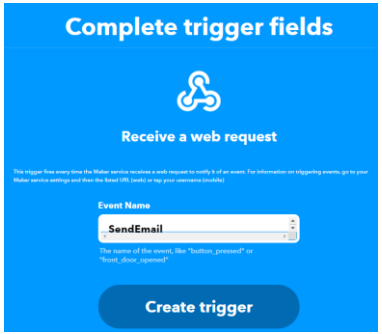
F2 model X1



IOT – IFTTT

Step 1. Go to https://ifttt.com/ , create applet (if webhooks then Email)

Trigger (This)
Webhooks:
receive a web request



Event name: SendEmail

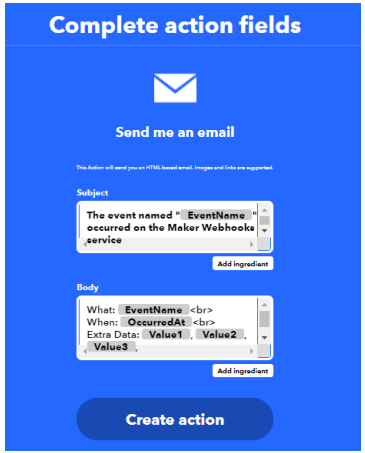
This: webhooks

If This Add

That: Email

Then That

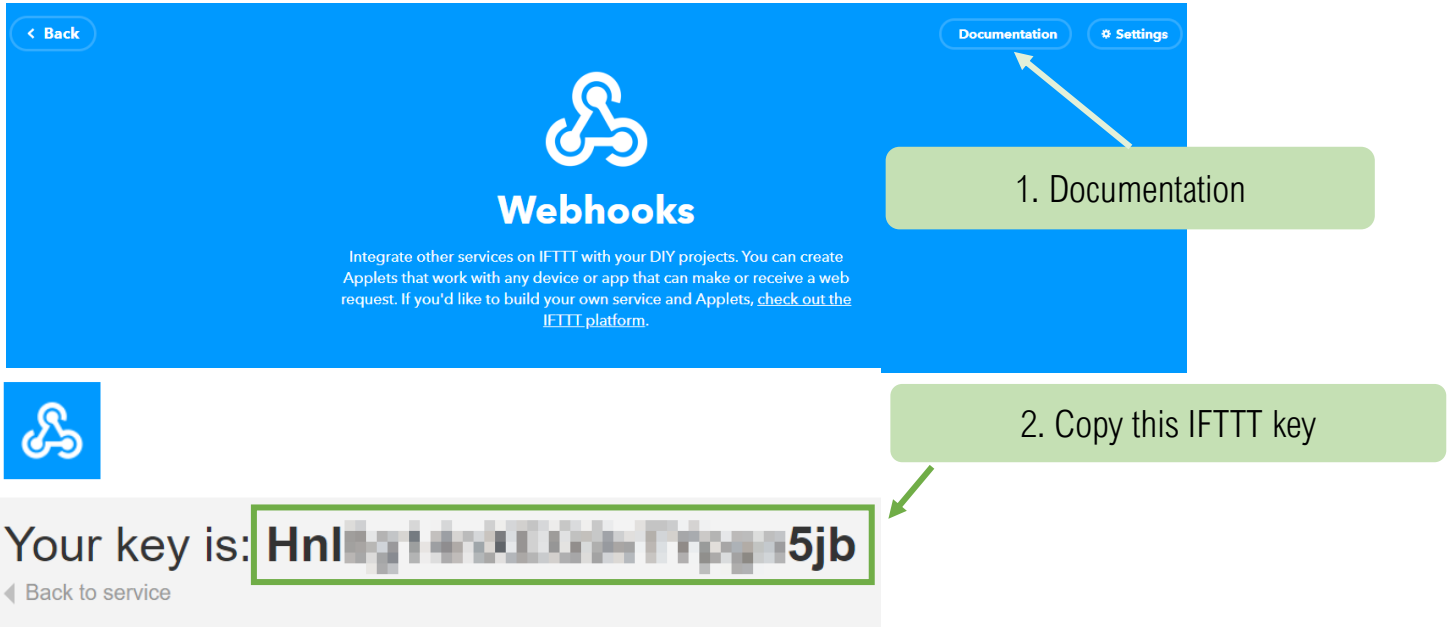
Action (That)
Email:
send me an email



https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter2.html

IOT – IFTTT

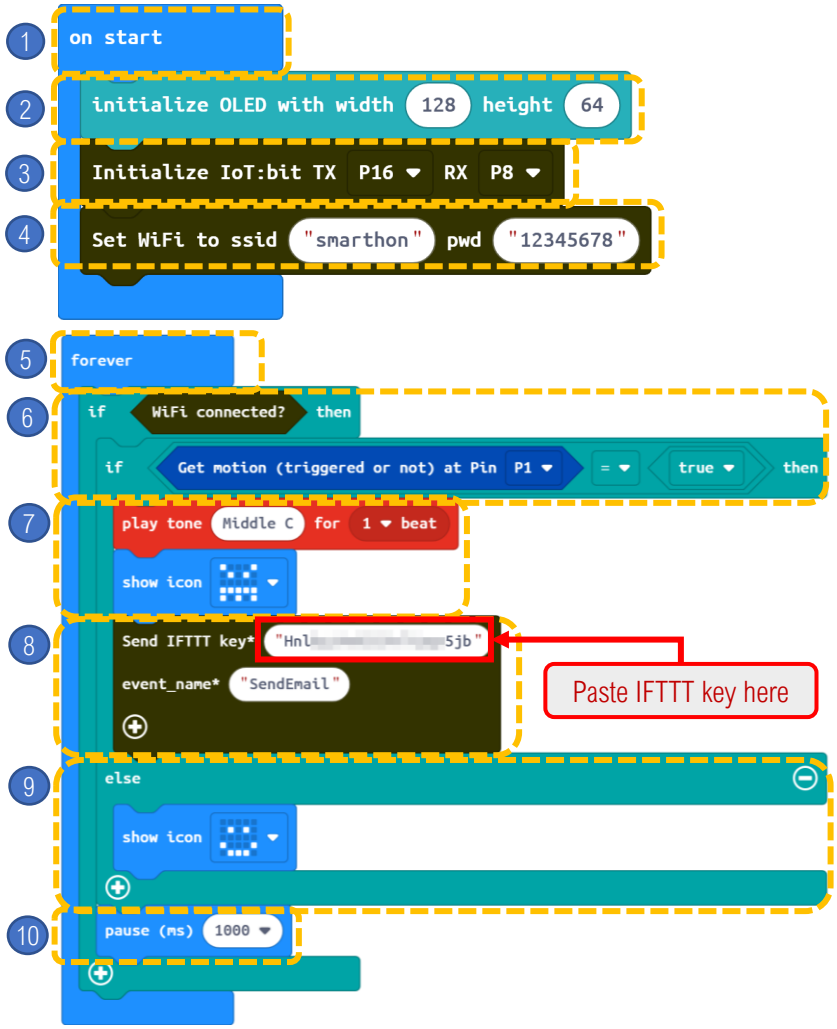
Step 2. Go to “My services” > “Webhooks”, select “Documentation” .
Copy your Webhooks Key as follows:



https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter2.html

CODING

How to avoid sending duplicate emails? (tips: using variable)?

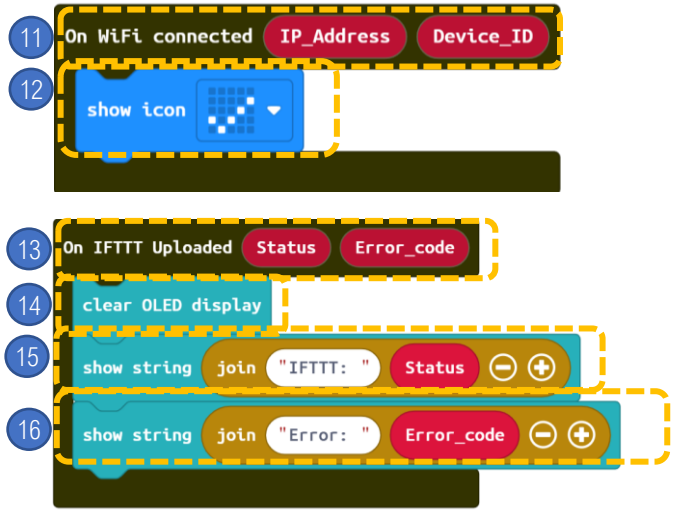


STEPS:

1. Block on start only runs once at the beginning.
2. Initialize OLED with width:128, height:64
3. Initialize IoT:bit at P16 and P8
4. Set WiFi connection by entering WiFi name and password
5. Block forever runs as a loop.
6. If WiFi is connected and if motion sensor is triggered then
7. Set buzzer to play tone Middle C for 1 beat and show a monster icon on micro:bit.
8. Send IFTTT event "SendEmail" with provided IFTTT key.
9. Else show a smile icon if there is no suspicious movement near the door.
10. Pause 1 second

CODING

How to avoid sending duplicate emails? (tips: using variable)?

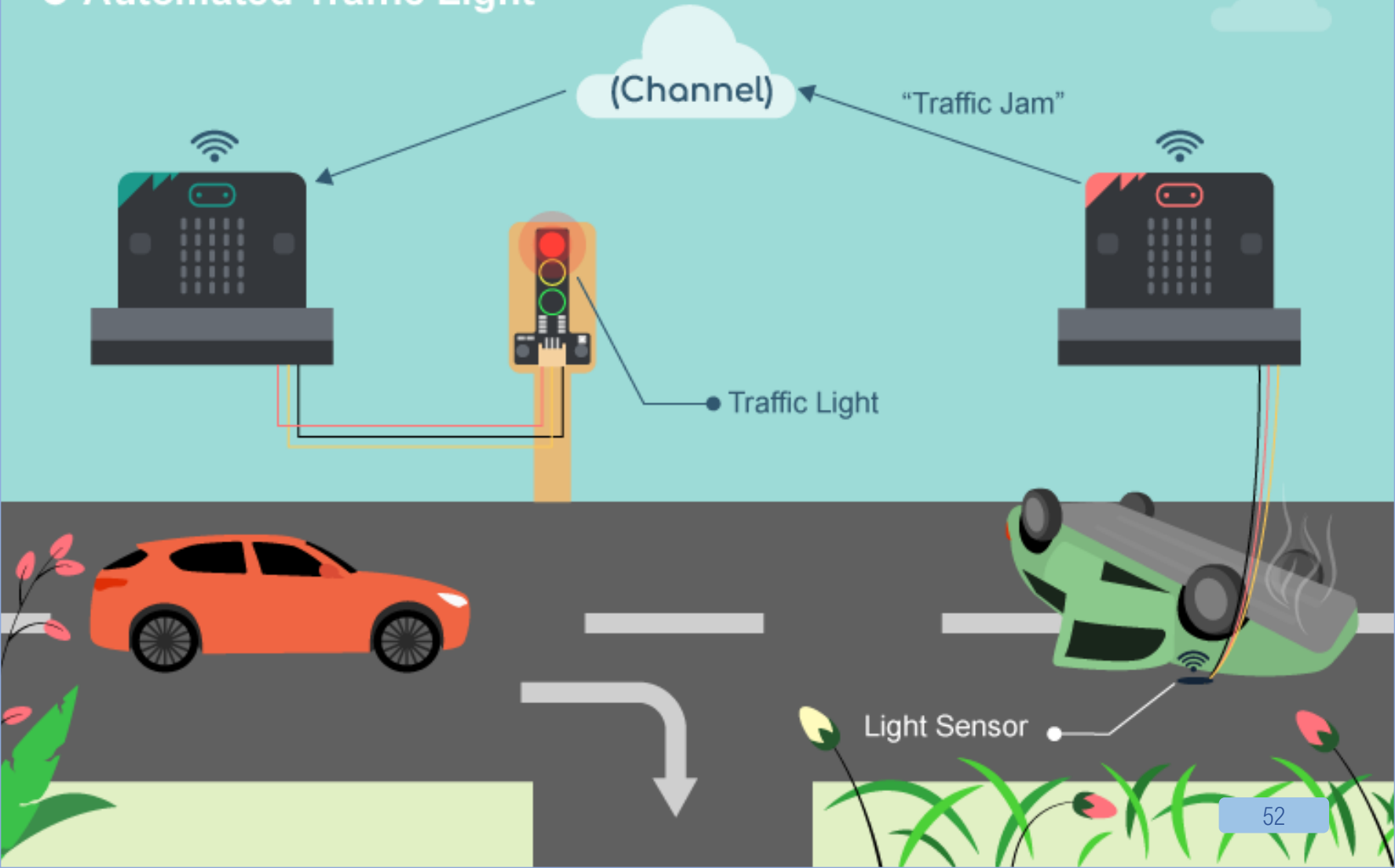


STEPS:

11. When WiFi is connected
12. Micro:bit LED will show icon “tick”

13. When IFTTT uploaded
14. Clear OLED display
15. Show string text “IFTTT” & Status
16. Show string text “Error” & Error_code

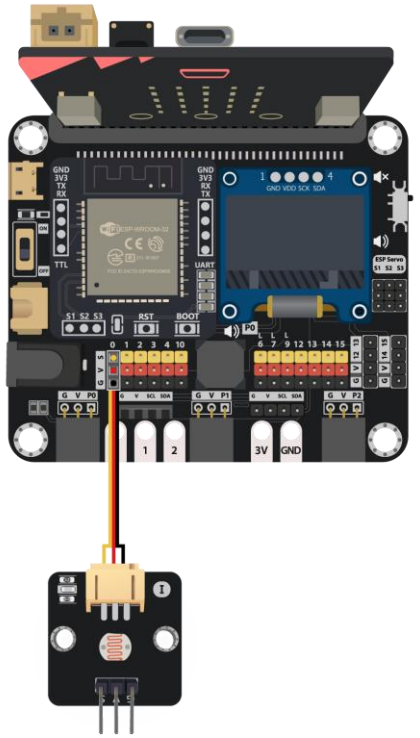
Automated Traffic Light



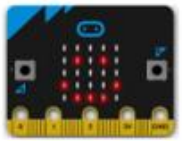
8. [IOT] AUTOMATED TRAFFIC LIGHT (SENDER)

LEVEL: ★ ★ ★ ★ ★

Introduction
When the light value detected is too low, this would represent there is a traffic jam and and a 'trafficjam' wifi message to another microbit. When the light value detected is high, this would represent there is no traffic jam and send a "nojam" wifi message to another micro:bit.
REMARKS: This project requires 2 micro:bit, one for SENDER and one for RECEIVER.



PART LIST



micro:bit (1)

IoT:bit with OLED (1)

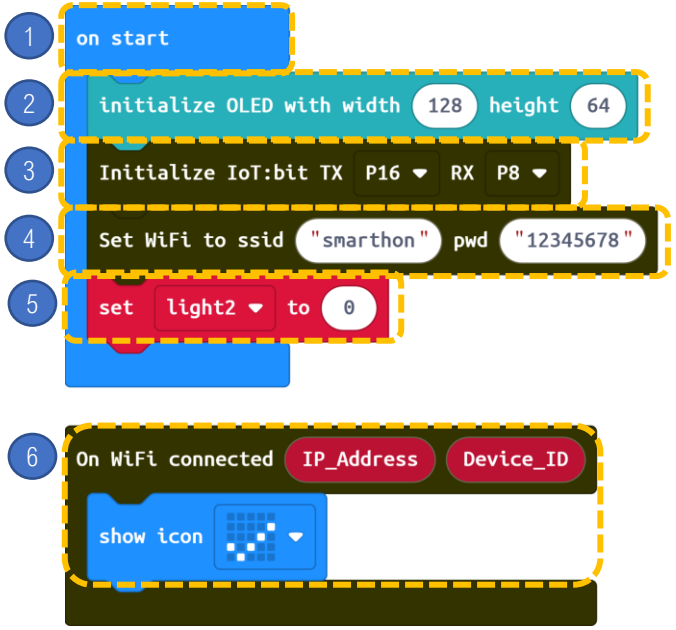
Light Sensor (1)

3-pin module wire (1)

https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter5.html

CODING

How can we use distance sensor to detect traffic status?



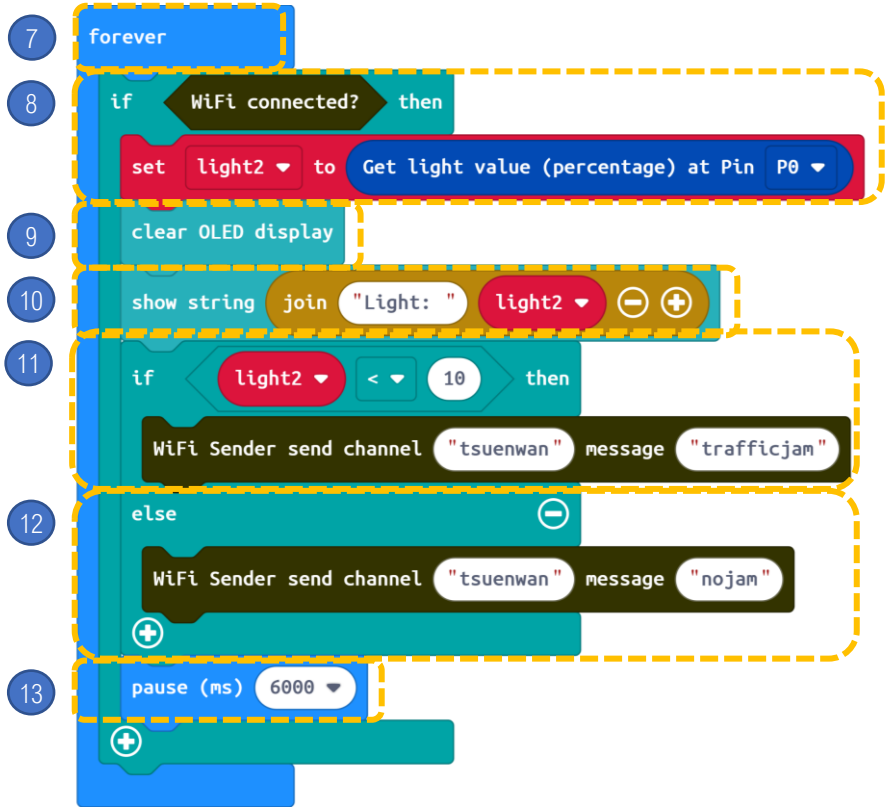
STEPS:

1. Block on start only runs once at the beginning.
2. Initialize OLED with width:128, height:64
3. Initialize IoT:bit at P16 and P8
4. Set WiFi connection by entering WiFi name and password.
5. Set light2 to 0.

6. On WiFi connected, micro:bit LED will show icon “tick”

CODING

How can we use distance sensor to detect traffic status?



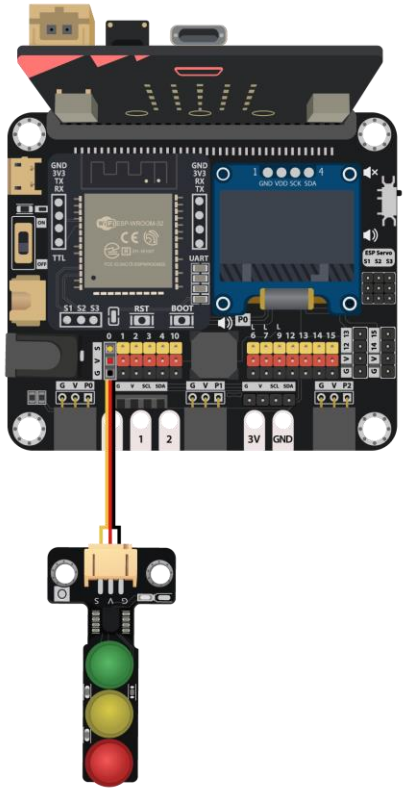
STEPS:

7. Block forever runs as a loop.
8. Set if **WiFi** is connected, set light2 to get value from P0
9. Clear OLED display
10. Show string text "LIght:" & light2
11. If light2 < 10 then **WiFi** send message trafficjam in channel "tsuenwan".
12. Else, **WiFi** send message nojam in channel "tsuenwan".
13. Pause for 6 seconds.

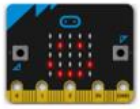
8. [IOT] AUTOMATED TRAFFIC LIGHT (RECEIVER)

LEVEL: ★ ★ ★ ★ ★

Introduction
When a wifi message “trafficjam” is received, it means there is traffic jam forward. The traffic LED Module will turn red. When a wifi message “nojam” is received, it means there is no traffic jam forward. The traffic LED Module will turn green. By using smart traffic light, the problem of traffic jam can be reduced as automatic traffic control is used.
REMARKS: This project requires 2 micro:bit, one for SENDER and one for RECEIVER.



PART LIST


micro:bit (1)


IoT:bit with OLED (1)

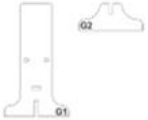

Traffic Light Module (1)


3-pin module wire (1)


M4*10mm Screw (2)


M4 Nut (2)

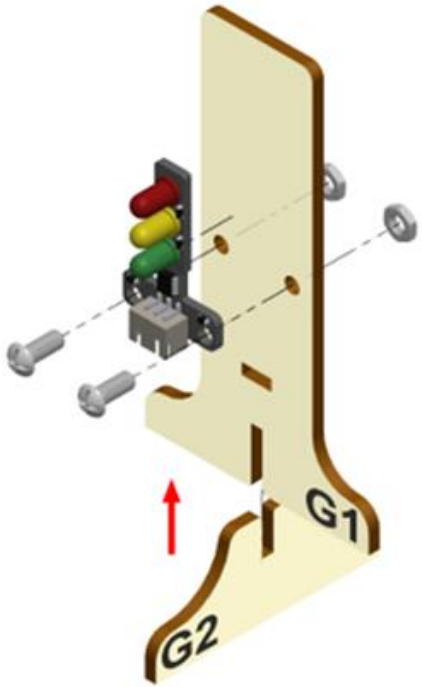

Screwdriver (1)

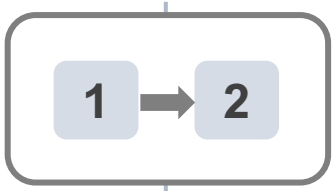

G1-G2 Model (1)

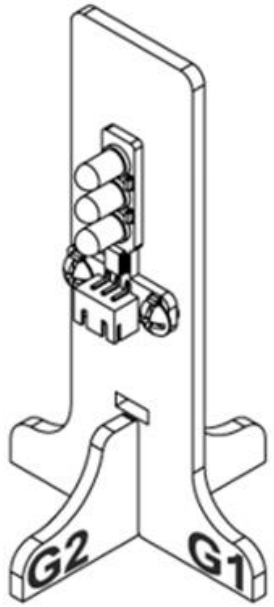
https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter5.html

ASSEMBLY STRUCTIONS

G1-G2 model	X1
Traffic light module	X1
M4 Nut	X2
M4*10mm Screw	X2

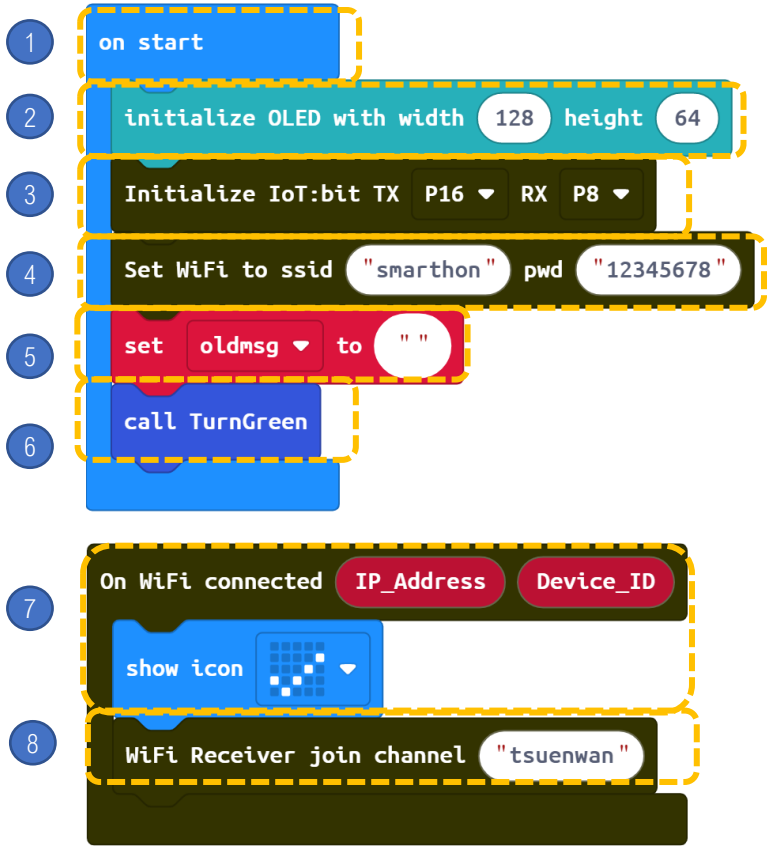






CODING

How can we add sound effect to the traffic LED Module according to the corresponding color?

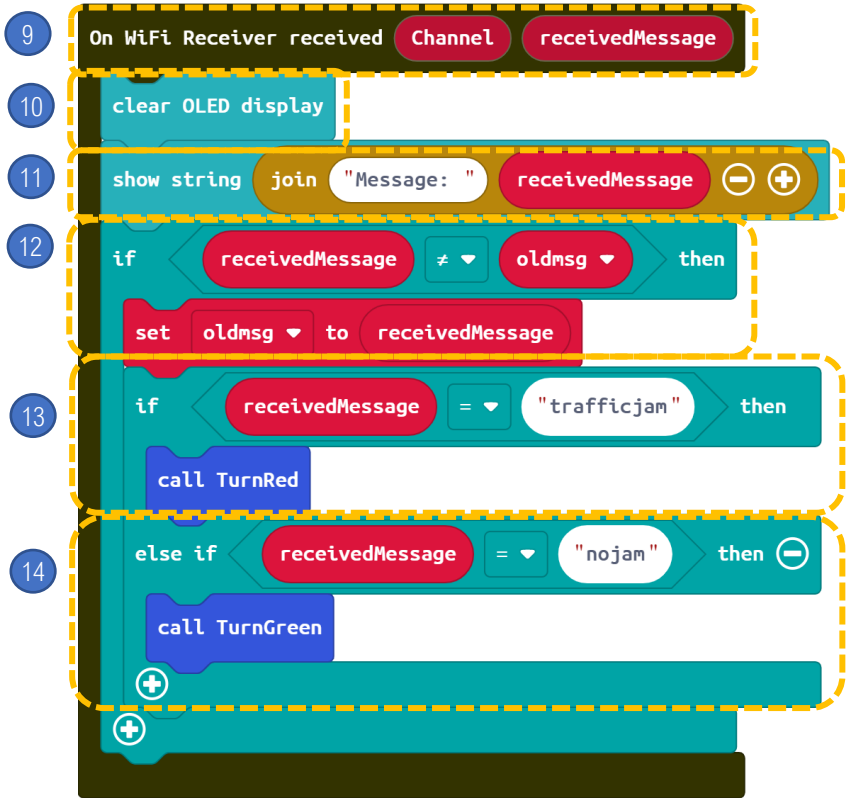


STEPS:

1. Block on start only runs once at the beginning
2. Initialize OLED with width:128, height:64
3. Initialize IoT:bit at P16 and P8
4. Set WiFi connection by entering WiFi name and password.
5. Set oldmsg = “”
6. Call TurnGreen
7. On WiFi connected, Micro:bit LED will show icon “tick”
8. WiFi Reciever join channel “tsuenwan”

CODING

How can we add sound effect to the traffic LED Module according to the corresponding color?



STEPS:

9. When WiFi received message from channel
10. Clear OLED display
11. Show string text “Message:” & receivedMessage
12. If receivedMessage ≠ oldmsg, then
    Set oldmsg = receivedMessage
13. if recievedMessage = “trafficjam”, then
    call TurnRed
14. Else if recievedMessage = nojam, then
    call TurnGreen.

CODING

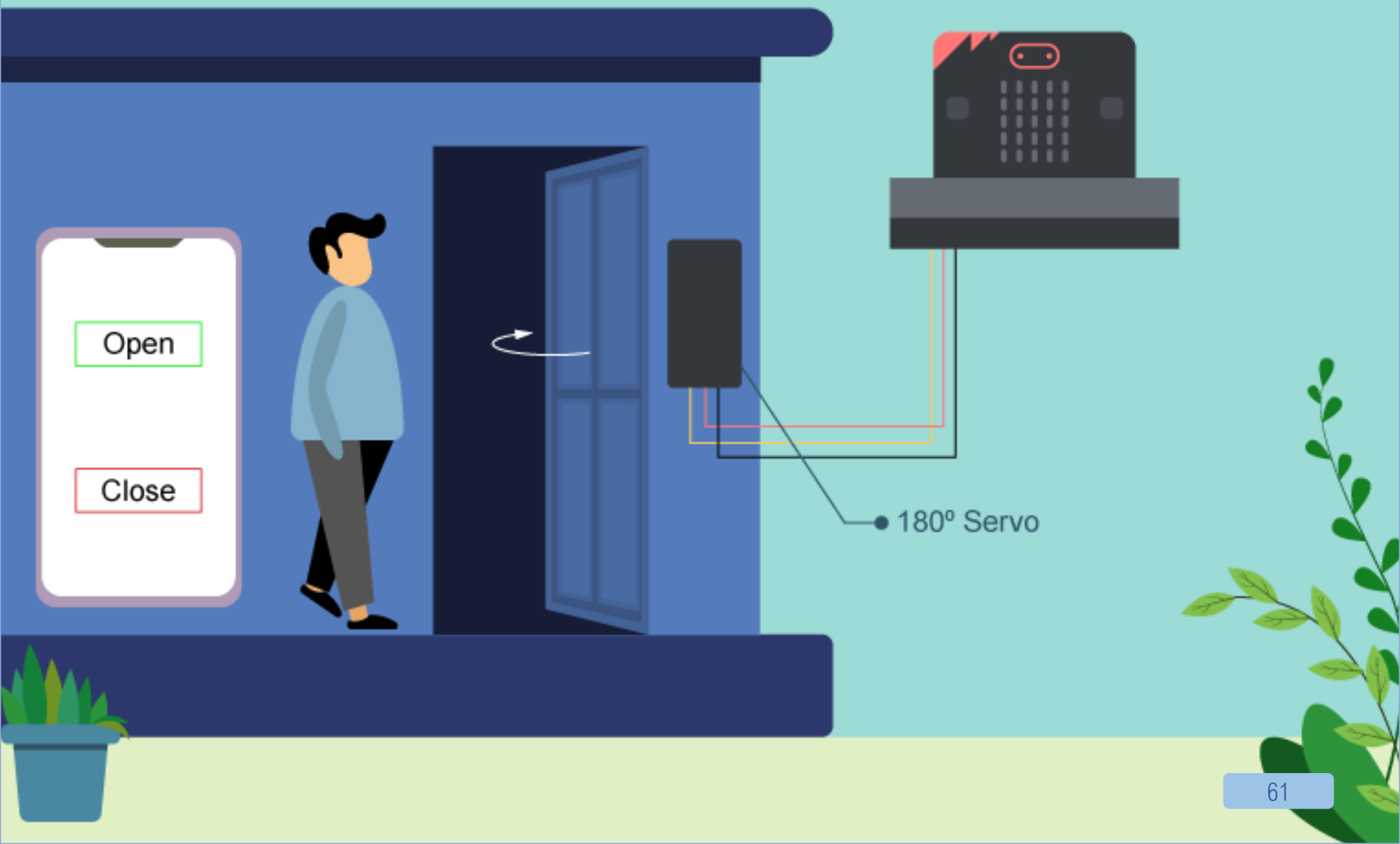
How can we add sound effect to the traffic LED Module according to the corresponding color?

15

STEPS:

15. Set up two new functions (TurnRed & TurnGreen). In function TurnRed, control traffic light to turn from green, then yellow and finally red, each colour pauses for 2000ms. In function TurnGreen, control traffic light to turn from red, then red and yellow at the same time and finally green, each colour pauses for 2s.

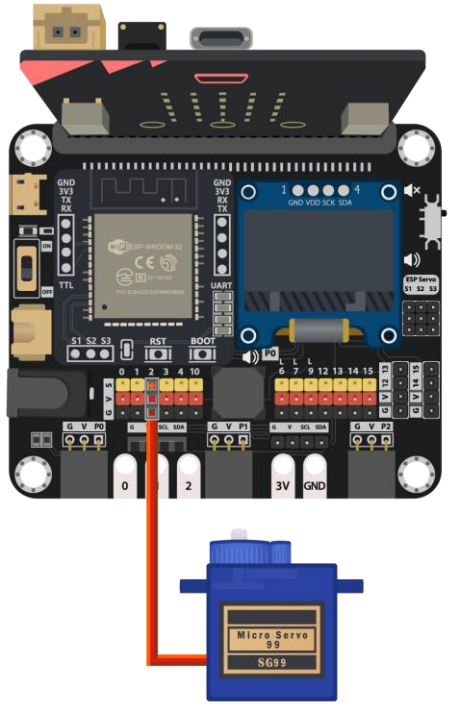
Smart House Door Control



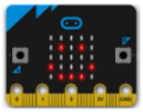
9. [IOT] SMART HOUSE DOOR CONTROL

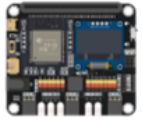
LEVEL: ★ ★ ★ ★ ☆

Introduction
When the micro:bit receives the signal “opendoor” from the app, the 180° servo will turn for 180° to open the door. When the micro:bit receives the signal “closedoor” from the app, the 180° servo will turn back 180° to close the door.



PART LIST


micro:bit (1)


IoT:bit with OLED (1)

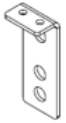

180° Servo (1)


Servo horn (1)


Servo M2*7.5mm sharp screw (1) (Included in servo pack)


M3*10mm Screw (2)


M3 Nut (2)


L-shaped stand (1)

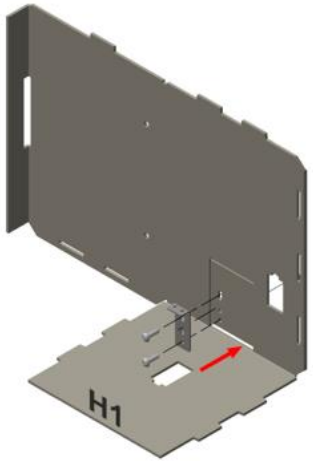

Paper clip (1)


Screwdriver (1)

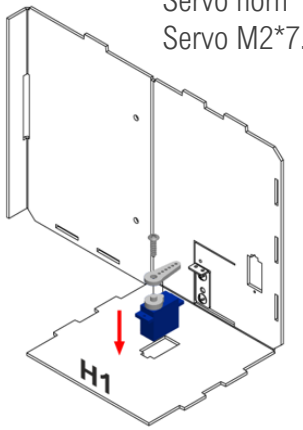

H1-H2 Model (1)

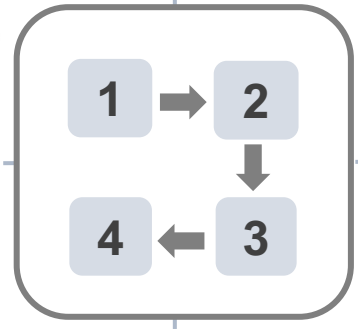
ASSEMBLY STRUCTIONS

L-shaped stand X1
M4 Nut X2
M4*10mm Screw X2
H1 model X1

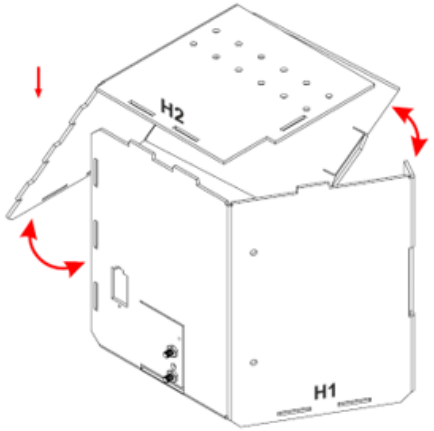


180º Servo X1
Servo horn X1
Servo M2*7.5mm sharp screw X1

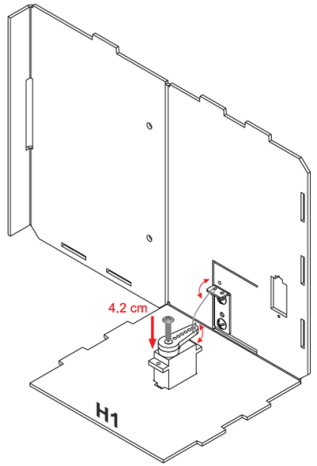




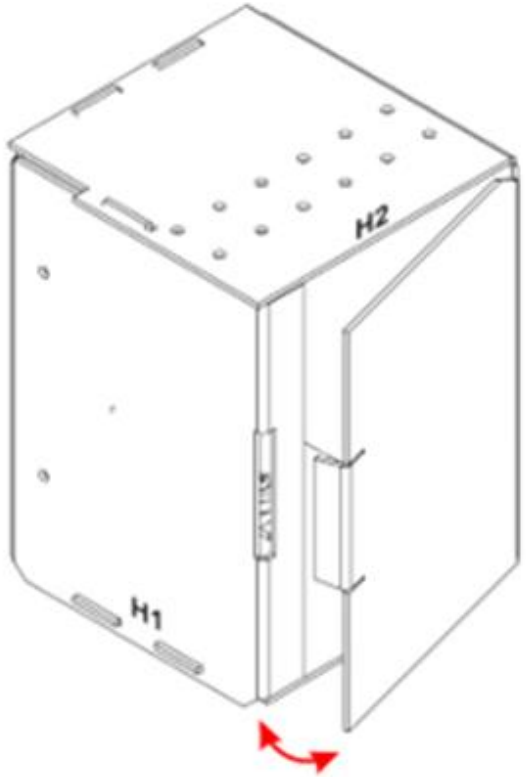
H2 model X1



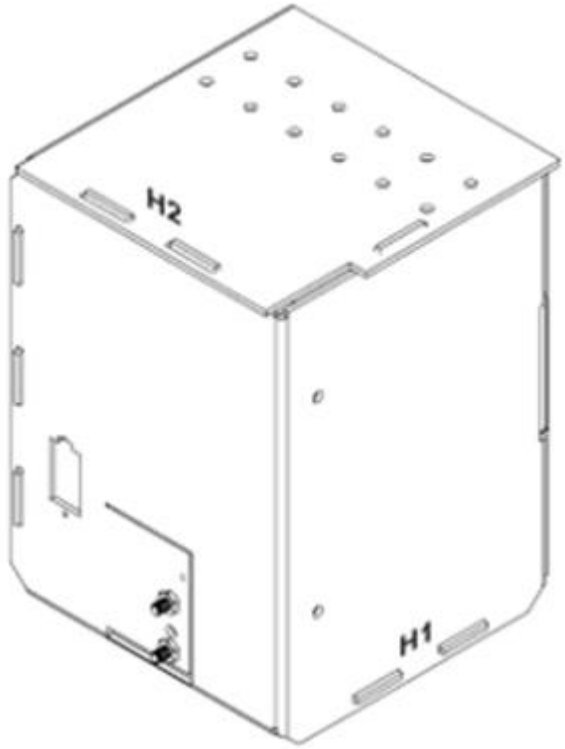
Paper Clip X1



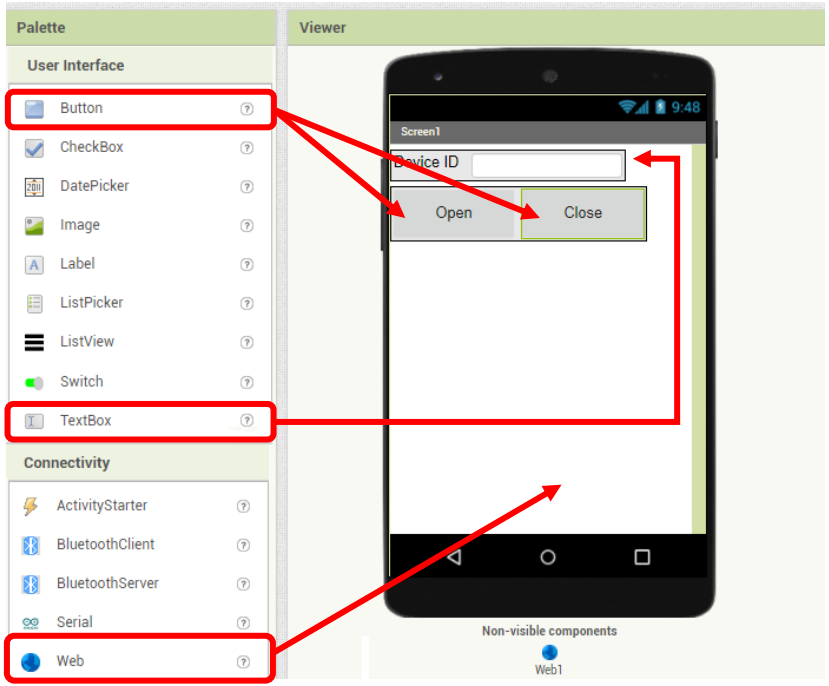
ASSEMBLY STRUCTIONS



5 → 6



IOT – APP INVENTOR 2



Step 1. Create the page with the components

On Designer:

Drag the components from the left menu –
2 “Buttons” (to open or close the door) and a “Textbox” (to input the Device ID number).

Then, add the invisible component “Web” under connectivity, we will need it for WAN connection.

https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter3.html

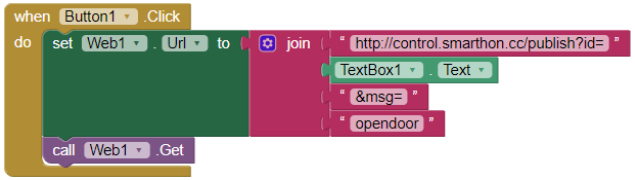
IOT – APP INVENTOR 2

Step 2. Make the programming part

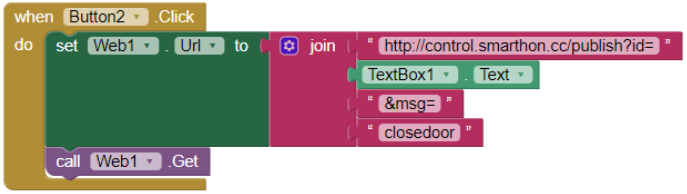
- On Blocks:
- The WAN control command URL is:

  http://control.smarthon.cc/publish?id=DeviceID&msg=ControlCommand

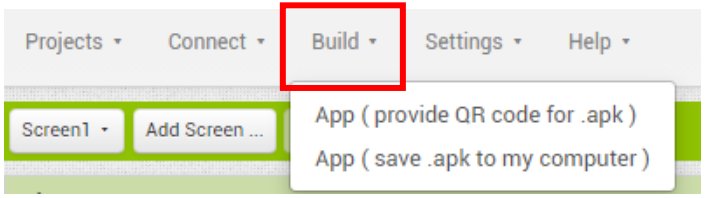
- When Button1 is clicked, it will direct to the URL with given device ID and command “opendoor”.



- When Button2 is clicked, it will direct to the URL with given device ID and command “closedoor”.

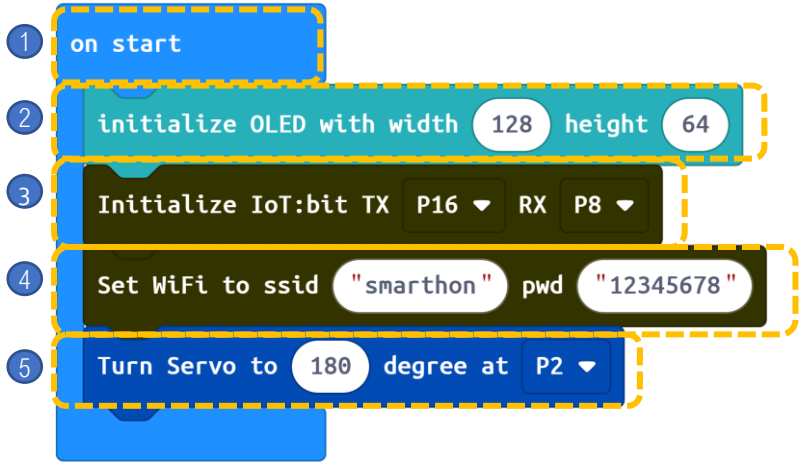


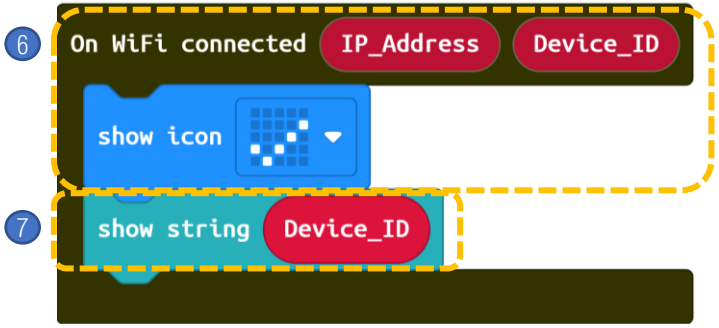
- Download the App in your phone to by .apk or scan QR code.



CODING

How can we add password authentication to open the door?



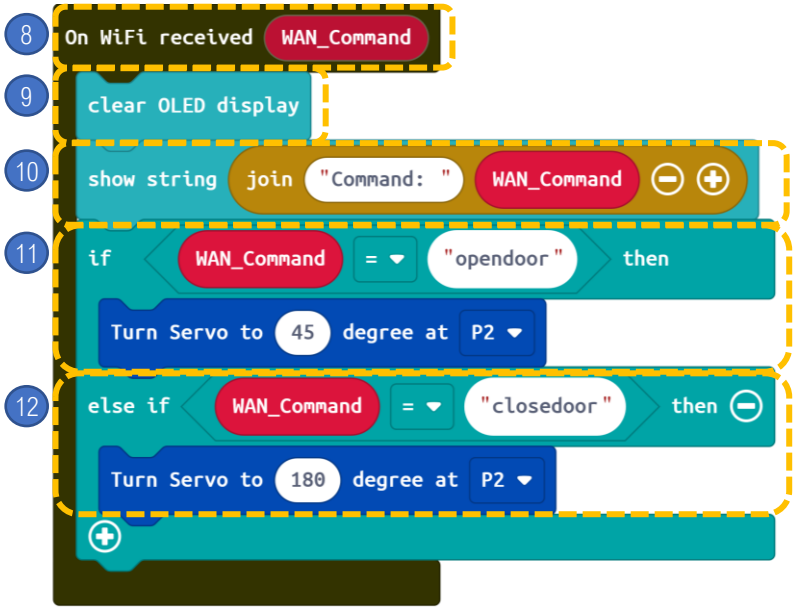


STEPS:

1. Block on start only runs once at the beginning.
2. Initialize OLED with width:128, height:64
3. Initialize IoT:bit at P16 and P8
4. Set WiFi connection by entering WiFi name and password.
5. turn servo to 180 degree at P2.
6. On WiFi connected, micro:bit LED will show icon “tick”
7. Show string Device_ID

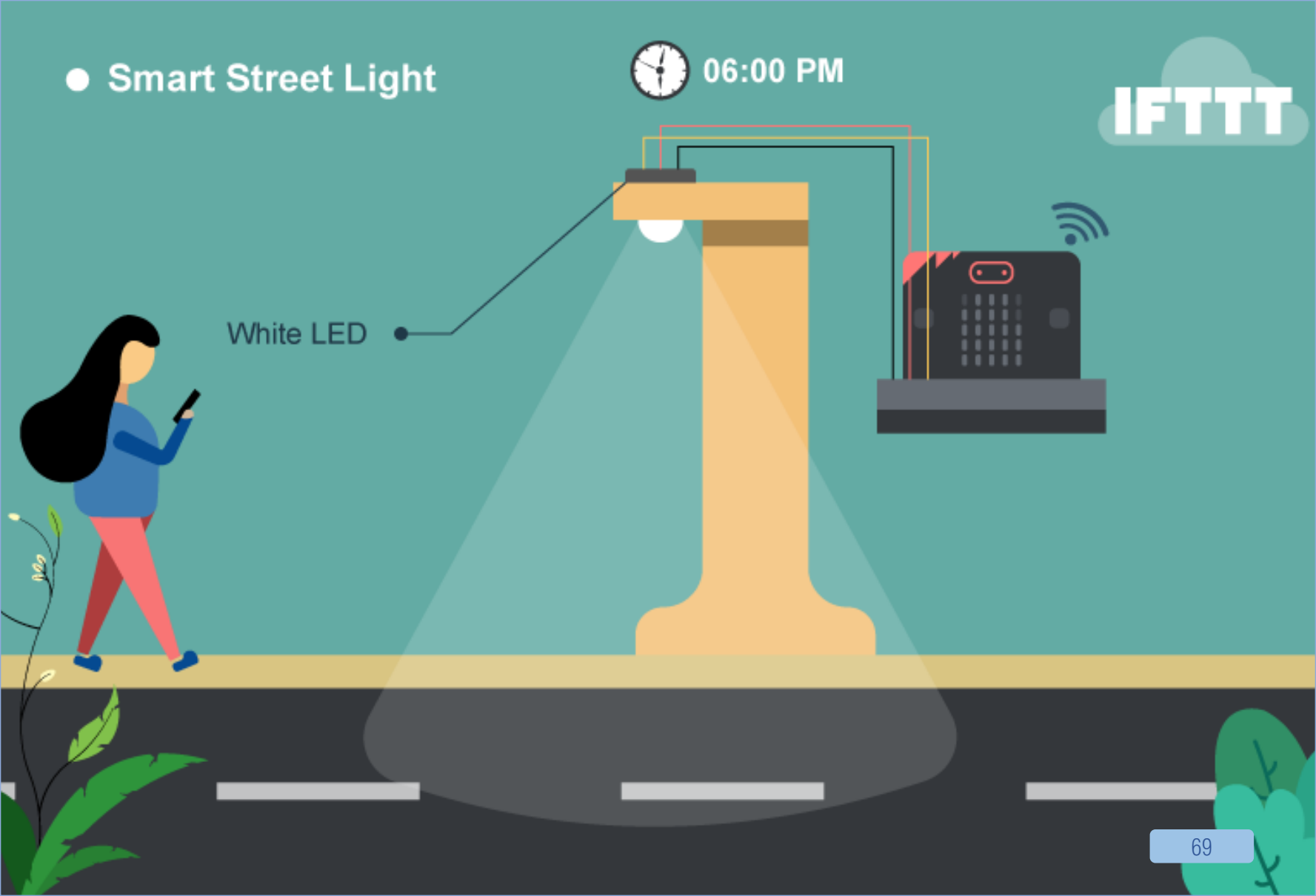
CODING

How can we add password authentication to open the door?



STEPS:

8. When WAN command is received,
9. Clear OLED display
10. Show string text “Command:” & WAN_Command
11. If WAN_Comand = “opendoor” then turn servo to 45 degree at P2
12. Else if WAN_Command = “closedoor” then, turn servo to 180 degree at P2.

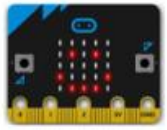

Smart Street Light
06:00 PM
IFTTT
White LED

10. [IOT] SMART STREET LIGHT

LEVEL: ★ ★ ★ ★ ☆

Introduction
To improve the living stand of citizen and to save electricity, smart street light can be automatically turned on at night (e.g. 6pm) and turned off in the morning (e.g. 6am).

PART LIST


micro:bit (1)


IoT:bit with OLED (1)

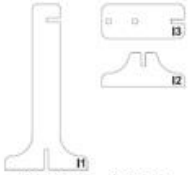

White LED Light (1)


3-pin module wire (1)


M4*10mm Screw (2)

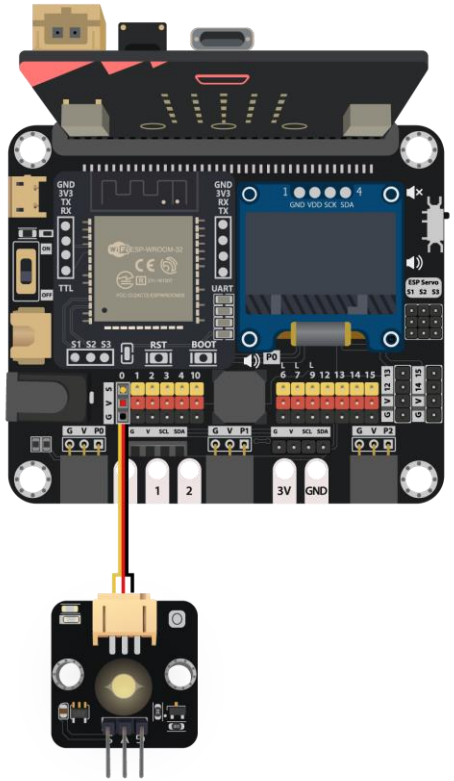

M4 Nut (2)


Screwdriver (1)



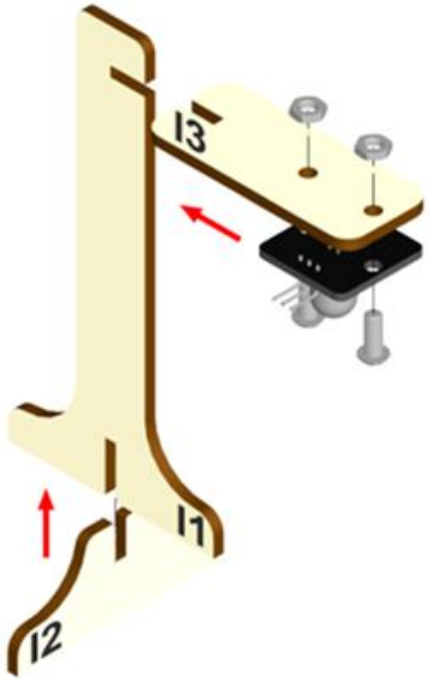
I1-I2 Model (1)

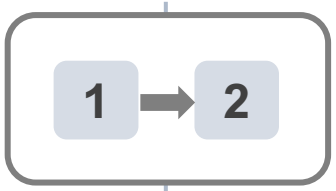
IFTTT

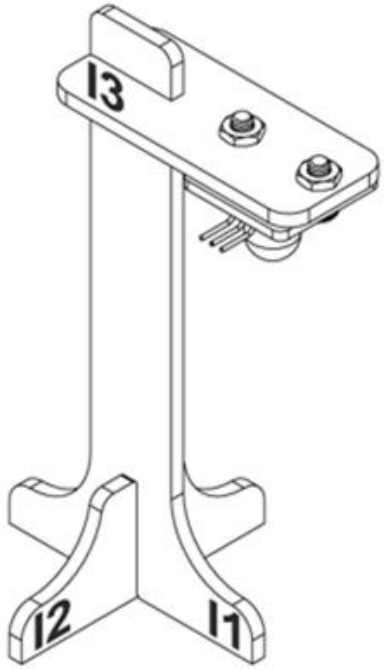


ASSEMBLY STRUCTIONS

I1-I3 model	X1
LED light	X1
M4 Nut	X2
M4*10mm Screw	X2

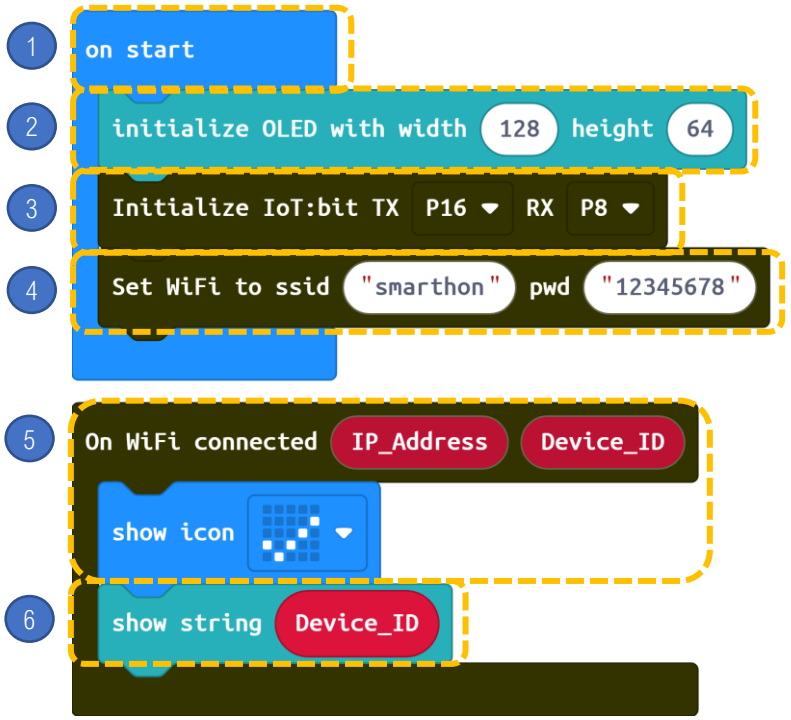






CODING

How to turn on the light automatically if the today's weather is cloudy reported by IFTTT?



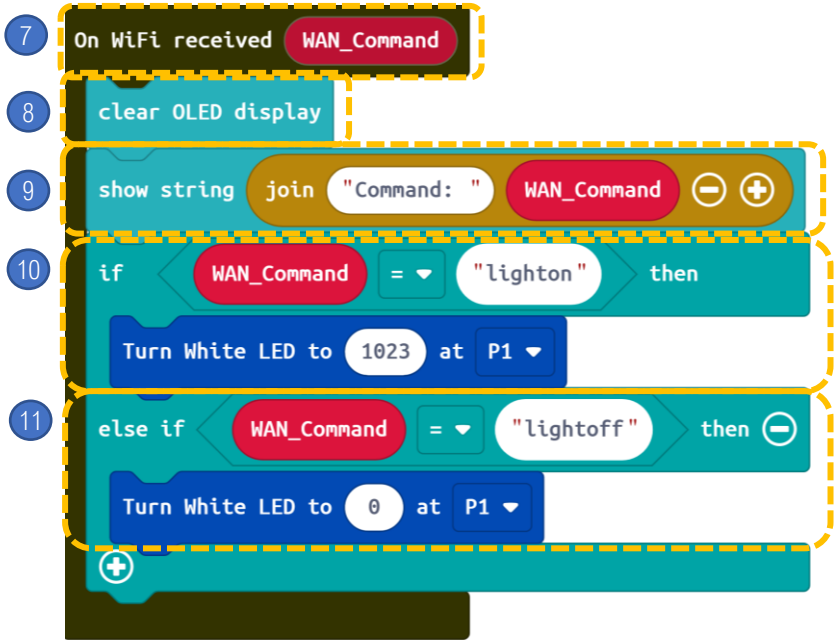
STEPS:

1. Block on start only runs once at the beginning.
2. Initialize OLED with width:128, height:64
3. Initialize IoT:bit at P16 and P8
4. Set WiFi connection by entering WiFi name and password.

5. On WiFi connected, micro:bit LED will show icon "tick"
6. Show string Device_ID

CODING

How to turn on the light automatically if the today's weather is cloudy reported by IFTTT?

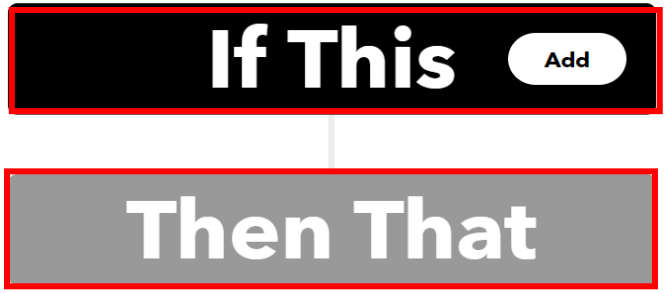


STEPS:

7. When WAN command is received,
8. Clear OLED display
9. Show string text "Command:" & WAN_Command
10. If WAN_Command = lighton then, turn White LED to 1023 at P1.
11. If WAN_Command = lightoff then, turn White LED to 0 at P1.

IOT – CLOUD CONTROL BY IFTTT

Step 1. Create applet (If Date&time then Smarthon IoT (micro:bit)



This: Date&time

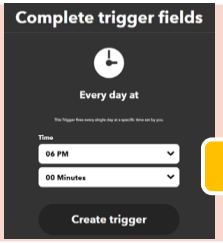
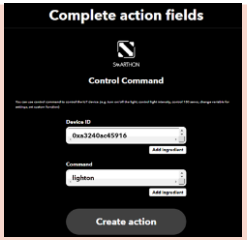
That: Smarthon IoT (micro:bit)

https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter4.html

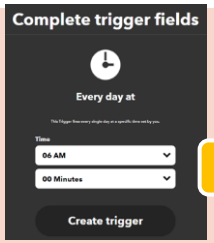
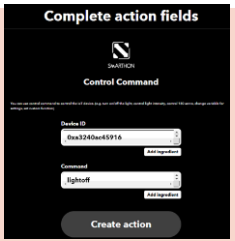
IOT – CLOUD CONTROL BY IFTTT

Step 2.

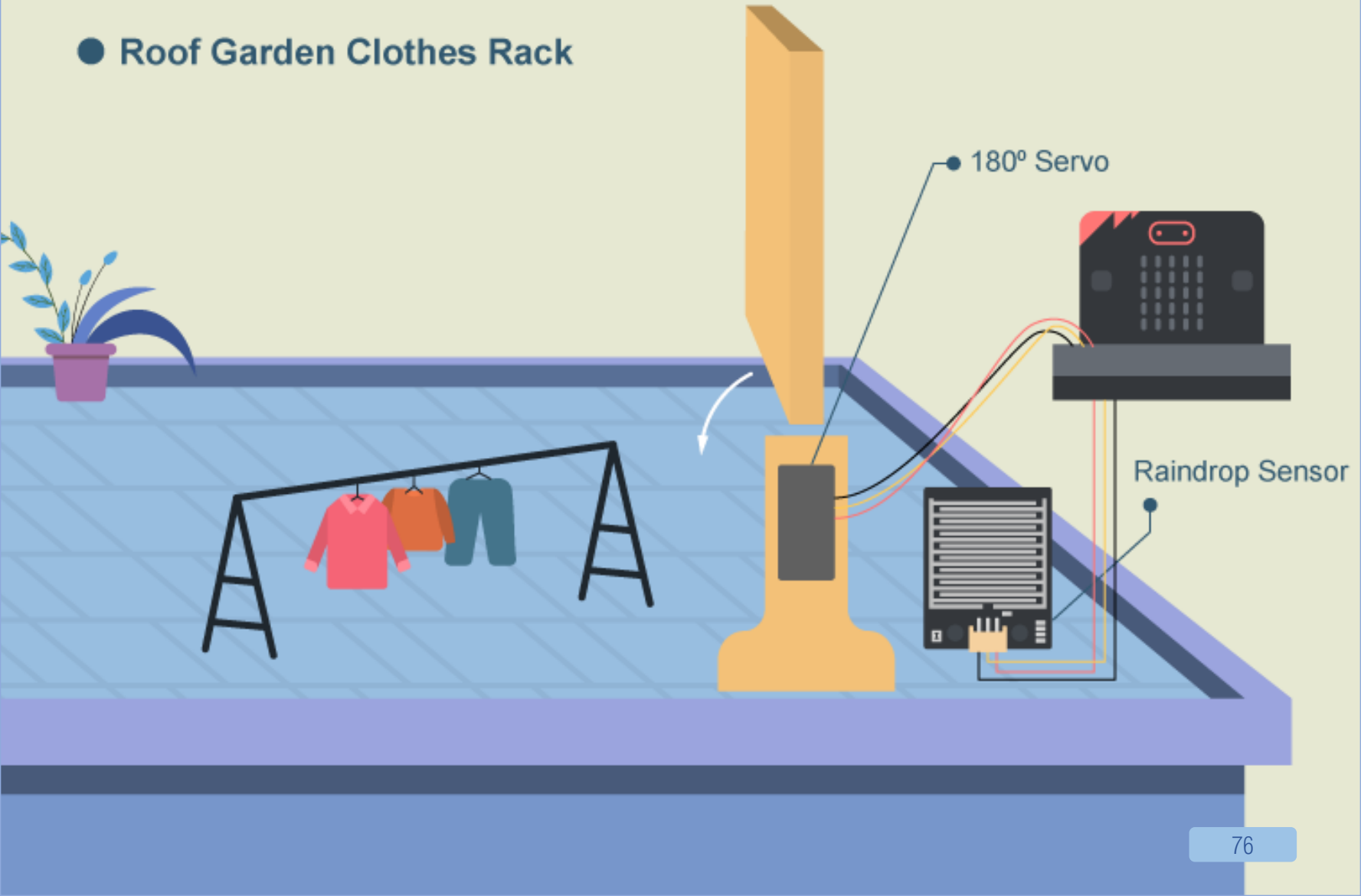
•If it is at 18:00, send WAN control command: light on to the micro:bit

Trigger (This): Date&time Every day at	Action (That): Smarhon IoT (micro:bit) Control Command
 6:oopm	 Device ID lighton

•If it is at 06:00, send WAN control command: light off to micro:bit

Trigger (This): Date&time Every day at	Action (That): Smarhon IoT (micro:bit) Control Command
 6:ooam	 Device ID lightoff

* Load the program to micro:bit and get your device ID

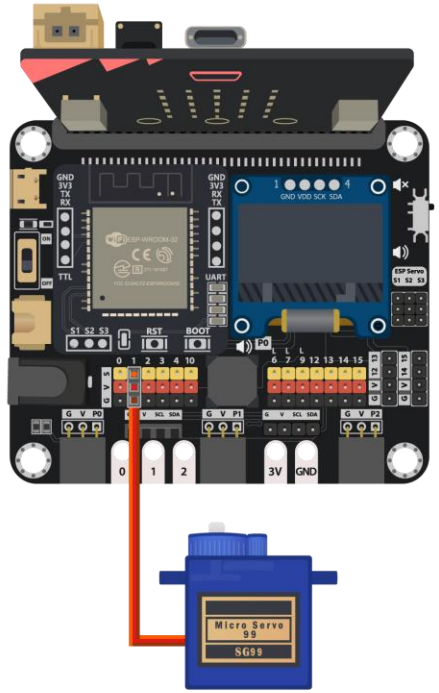

Roof Garden Clothes Rack
180º Servo
Raindrop Sensor

11. [IOT] ROOF GARDEN CLOTHES RACK

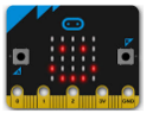
IFTTT

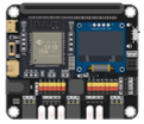
LEVEL: ★ ★ ★ ★ ☆

Introduction
When raindrop sensor sensed that it is raining, it will send a signal to micro:bit and therefore the clothes rack will be opened. When there is no rain, the clothes rack will be closed.
Also, micro:bit can receive WAN commands from WAN (eg. IFTTT), the the micro:bit will get the command name. the rack will be opened/closed.



PART LIST


micro:bit (1)


IoT:bit with OLED (1)


180° Servo (1)


3-pin module wire (1)


Servo M2*7.5mm sharp screw (1) (Included in servo pack)


M2*10mm Screw (2)


M2 Nut (2)


M4*10mm Screw (2)

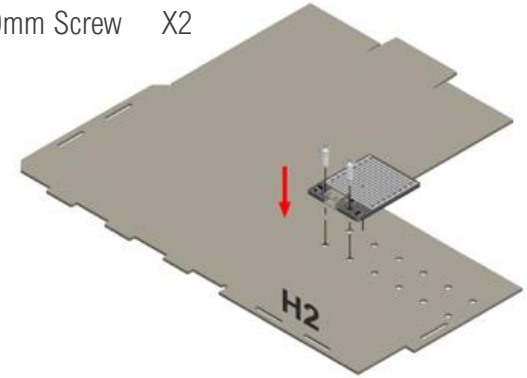

M4 Nut (2)


Screwdriver (1)

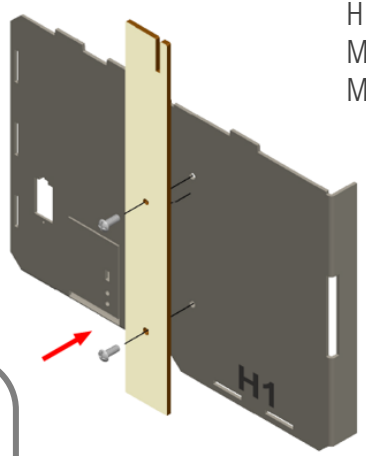

H1-H7 Model (1)

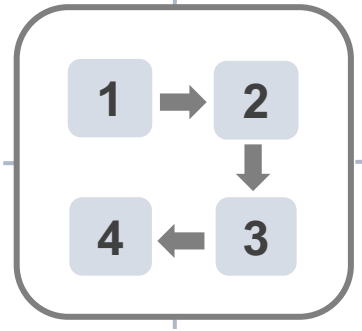
ASSEMBLY STRUCTIONS

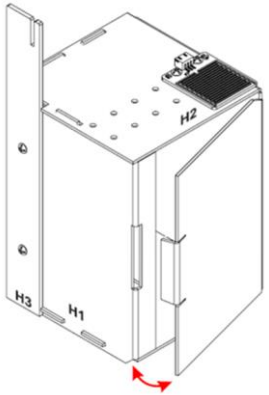
H2 model X1
Raindrop sensor X1
M4 Nut X2
M4*10mm Screw X2

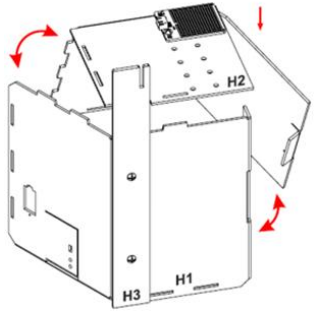


H1 & H3 model X1
M4 Nut X2
M4*10mm Screw X2



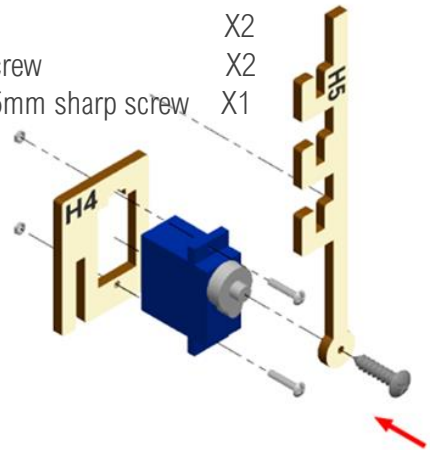




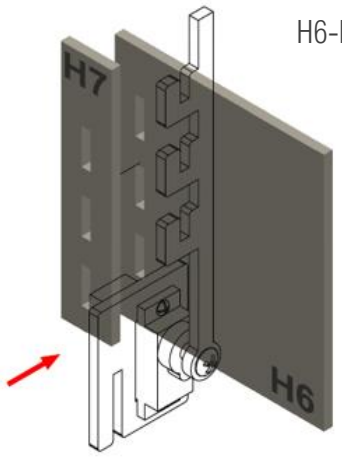


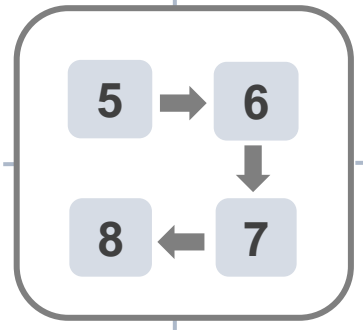
ASSEMBLY STRUCTIONS

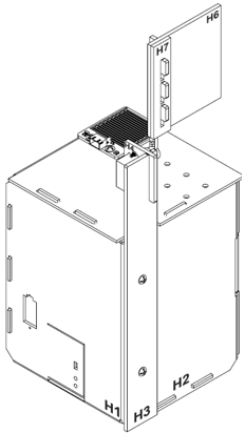
H4 - H5 model	X1
180º Servo	X1
M2 Nut	X2
M2*10mm Screw	X2
Servo M2*7.5mm sharp screw	X1

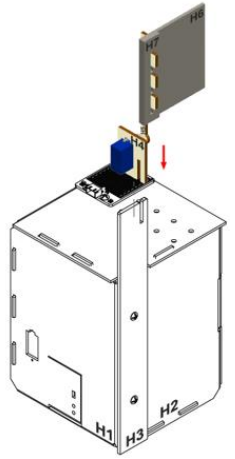


H6-H7 model X1









CODING

Can you control the clothing rack by other weather conditions? (e.g. sunlight)

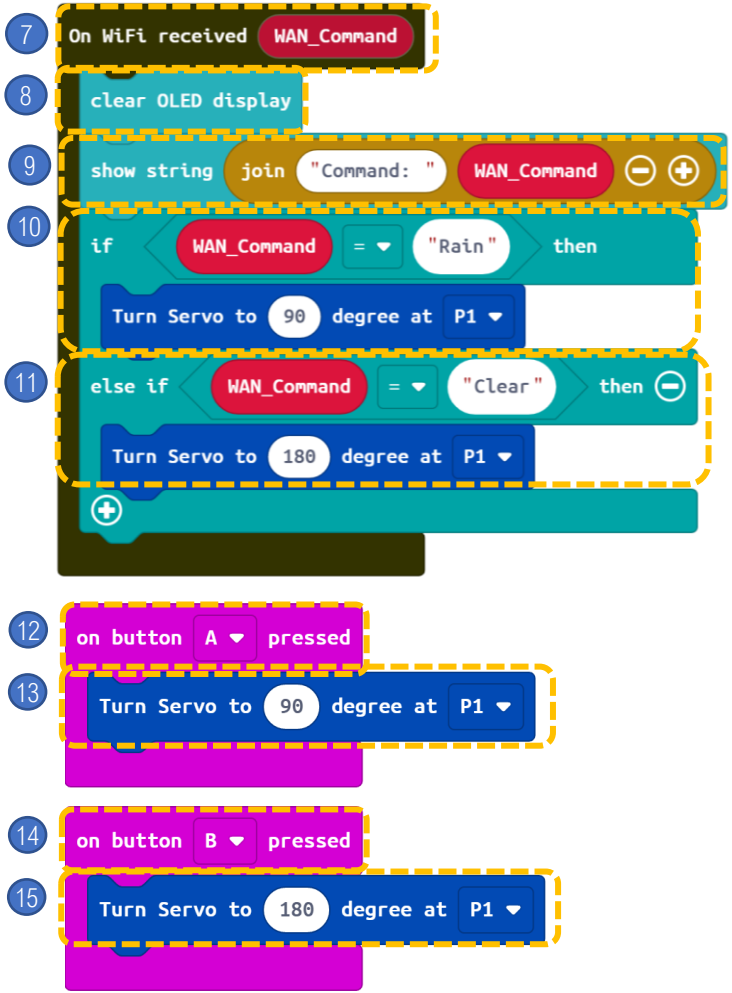
STEPS:

1. Block on start only runs once at the beginning.
2. Initialize OLED with width:128, height:64
3. Initialize IoT:bit at P16 and P8
4. Set WiFi connection by entering WiFi name and password.

5. On WiFi connected, micro:bit LED will show icon “tick”
6. Show string Device_ID

CODING

Can you control the clothing rack by other weather conditions? (e.g. sunlight)



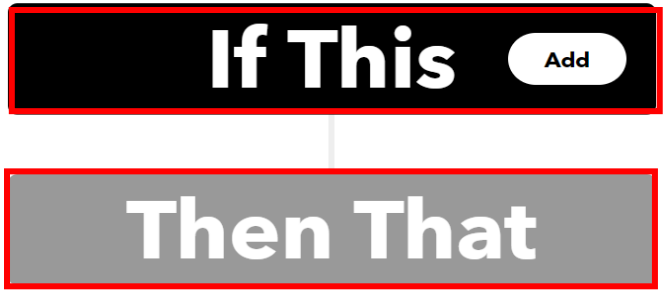
STEPS:

7. When WAN command is received,
8. Clear OLED display
9. Show string text "Command:" & WAN_Command
10. If WAN_Command = Rain then,
    Turn Servo to 90 degree at P1.
11. If WAN_Command = Clear then, Turn Servo to 180 degree at P1.

12. When button A is pressed,
13. Turn Servo to 90 degree at P1.
14. When button B is pressed,
15. Turn Servo to 180 degree at P1.

IOT – CLOUD CONTROL BY IFTTT

Step 1. Create applet: If Weather Underground then Smarthon IoT(micro:bit)



This: Date&time

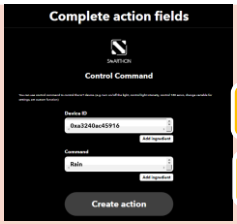
That: Smarthon IoT (micro:bit)

https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter4.html

IOT – CLOUD CONTROL BY IFTTT

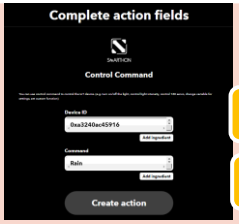
Step 2.

•If weather condition change to rain, send WAN control command: Rain to the micro:bit

Trigger (This): Weather Underground Current condition changes to	Action (That): Smarhon IoT (micro:bit) Control Command
 Rain	 Device ID Rain

• If weather condition change to clear, send WAN control command: Clear to micro:bit

.

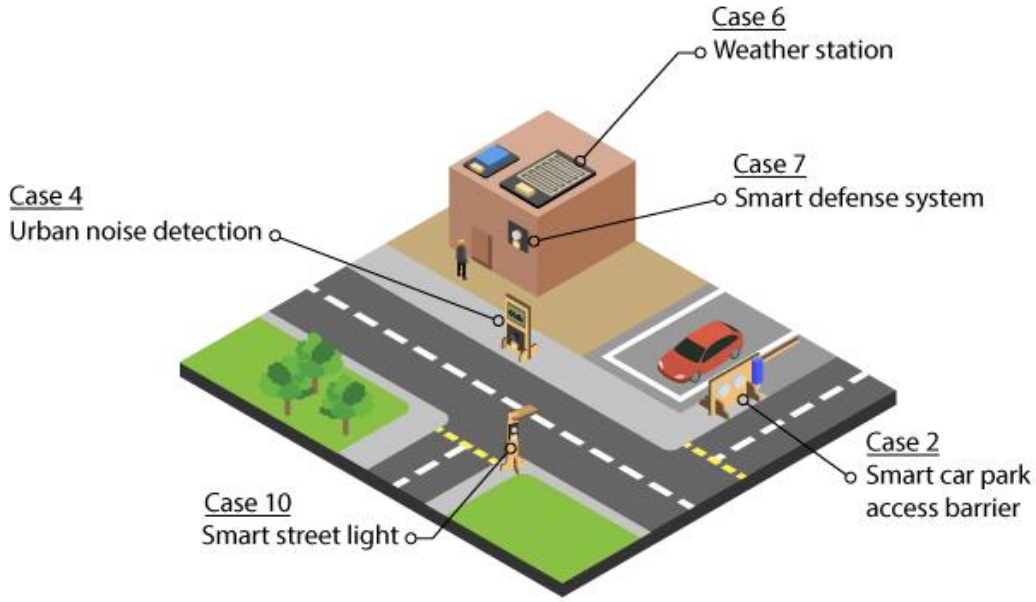
Trigger (This): Weather Underground Current condition changes to	Action (That): Smarhon IoT (micro:bit) Control Command
 Clear	 Device ID Clear

* Load the program to micro:bit and get your device ID

https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/chapter4.html

SCENARIO EXAMPLE 1: MODERN RESIDENTIAL HOUSE

Modern residential house focus on achieving a high living standard of the citizen. It includes automation system for parking and high security defence system. Noise and weather information are collected to evaluate the environmental comfortability of a city.



PARTS:

- Temperature and Humidity sensor (DHT11)
- Raindrop sensor
- Motion sensor
- Buzzer
- Light sensor
- 180° servos
- Distance sensor
- Noise sensor
- White LED module

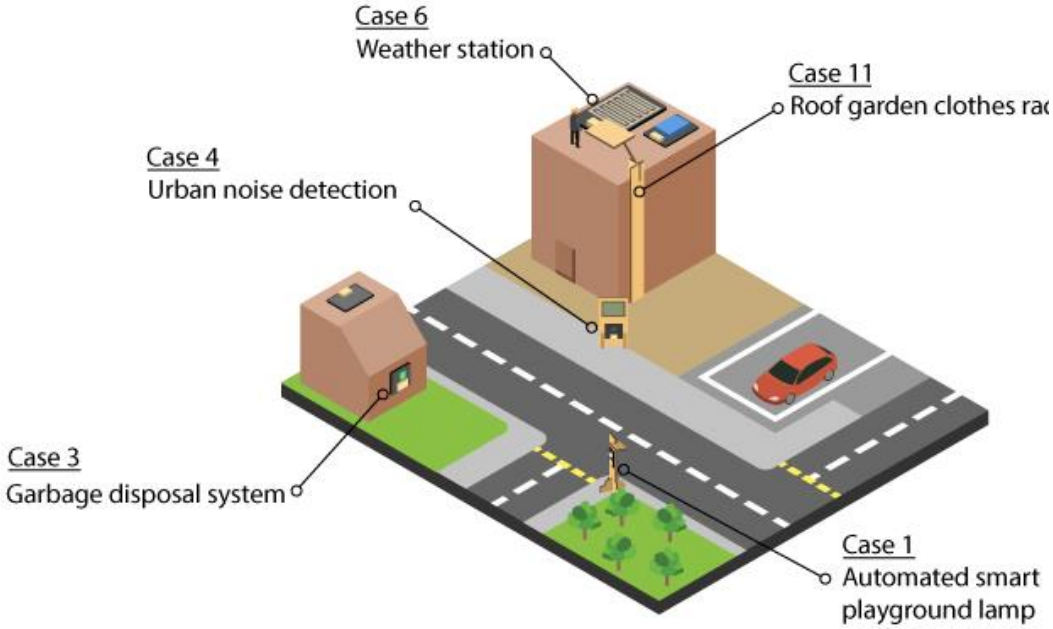
IOT:

- ThingSpeak
- IFTTT

You can design your own scenario, simply combine different cases together or create dedicated cases in your city!

SCENARIO EXAMPLE 2: GREEN ENGINEERING

It is a city development, which focus on high sustainability It includes increasing green areas, energy efficiency, reducing wastes, monitoring climate information and pollution states (eg. Noise).



PARTS:

- Temperature and Humidity sensor (DHT11)
- Raindrop sensor
- 180° servos
- White LED module
- Motion sensor
- Noise sensor
- Distance sensor
- Multi-color LED (WS2812B)

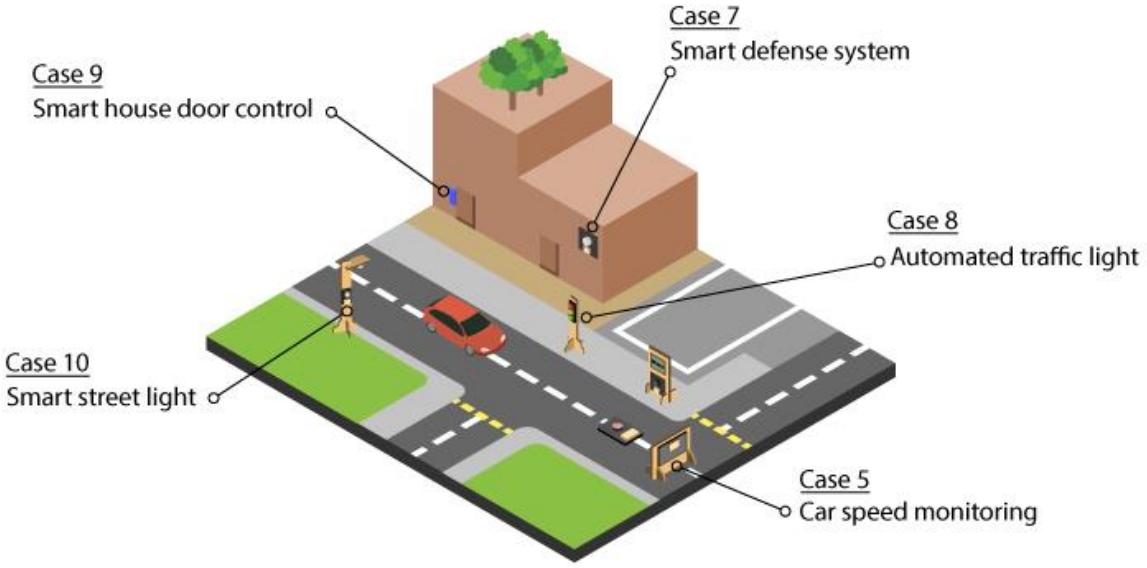
IOT:

- ThingSpeak
- IFTTT

You can design your own scenario, simply combine different cases together or create dedicated cases in your city!

SCENARIO EXAMPLE 3: TRANSPORT SAFETY AND SECURITY

The transport safety and security is the primary concern of a city. Car speed and traffic condition are being monitored in the public transportation system. only responsible person of the corporation can enter the building, alerts will be sent on the network if there are suspicious people nearby.



PARTS:

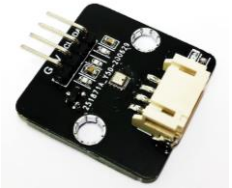
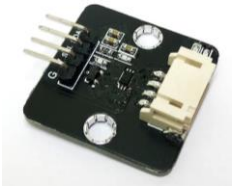
- 180° servos
- White LED module
- Buzzer
- Motion sensor
- Light sensor
- Traffic light module
- Distance sensor

IOT:

- App Inventor 2
- IFTTT
- WiFi channel

You can design your own scenario, simply combine different cases together or create dedicated cases in your city!

APPENDIX I:ELECTRONIC MODULES ON SMARTHON – FUTHUR EXPLORATION

	Water Pump		Temperature, Humidity and Pressure Sensor
	Motor Fan		Digital Light Sensor
	Water Temperature Sensor	For more information, please visit www.smarthon.cc.	

FOR MORE INFORMATION
PLEASE VISIT

https://smarthon-docs-en.readthedocs.io/en/latest/smartcity/index.html

www.smarthon.cc

INGITE YOUR CREATIVITY