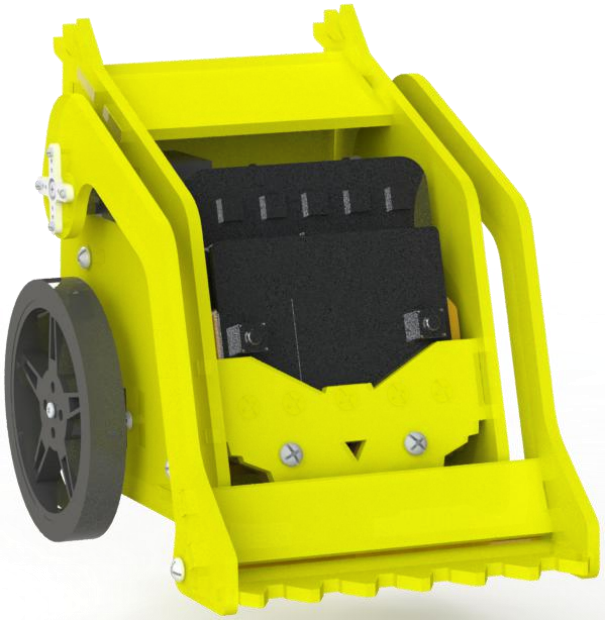
Keyestudio Micro:bit Desk Bit Mini Car

(with Micro:bit V2)



Contents

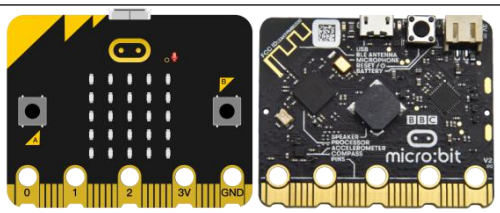
1. Description：

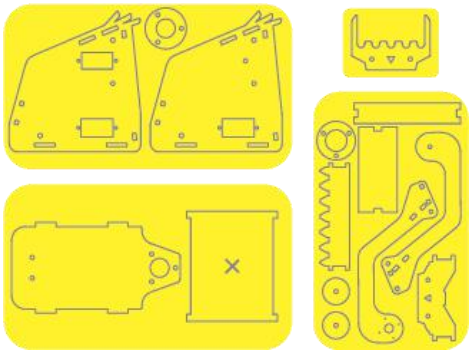
Keyestudio micro:bit desk bit car is designed by micro:bit V2. It consists of delicate servos, a control board with high quality and a yellow car body, which is extremely cool. You can control it via App or controller. In addition, a mountainous of comprehensive courses are provided to you. It is definitely the best choice for STEM creators and enthusiasts.

Features:

- Include micro:bit V2, acrylic board and servo board.
- Easy to build: most of components can be assembled with screws and nuts.
- Equipped with RGB light, battery holder, sensors and modules, the control board can drive three servos at same time.
- Multiple purpose: walking, singing, pushing stuff, drawing and playing music.
- Support Makecode graphical programming and App control
- 21 projects included

2. Kit:

Components			
#	**Model**	**QTY**	**Picture**
0	Micro:bit V2 is not included in KS4013 kit		
0	Micro:bit V2 is included in KS4026	1	

1	Keyestudio Control Board	1	
2	360° Servo	2	
3	180° Servo	1	
4	Micro USB Cable	1	
1	4 Pcs Acrylic Boards	1	
2	Wheels	2	
3	Universal Wheel	1	
Nuts/Screws			

1	M3*60MM Dual-pass Hex Copper Pillar	3	
2	M3*30MM Dual-pass Hex Copper Pillar	3	
3	M3*30+6MM Copper Pillar	1	
4	M3*35MM Dual-pass Hex Copper Pillar	1	
5	M3*12+6MM Copper Pillar	1	
6	M3*16MM Round Head Screws	1	
7	M2*10MM Round Head Screws	8	
8	M3*6MM Round Head Screws	12	
9	M3*12MM Round Head Screws	8	

10	M3 Nickel Plated Nuts	8	
11	M3 Nickel Plated Self-locking Nuts	2	
12	M2 Nickel Plated Nuts	8	
13	M1.2*5MM Round Head Self-tapping Screws	6	
Tools			
1	WB-558 White Board Pen	1	
2	3.0*40MM Screwdriver	1	
3	2.0*40MM Screwdriver	1	
4	M3+M4 Wrench	1	
5	1.5V AA Batteries (Not included in the kit)	3	

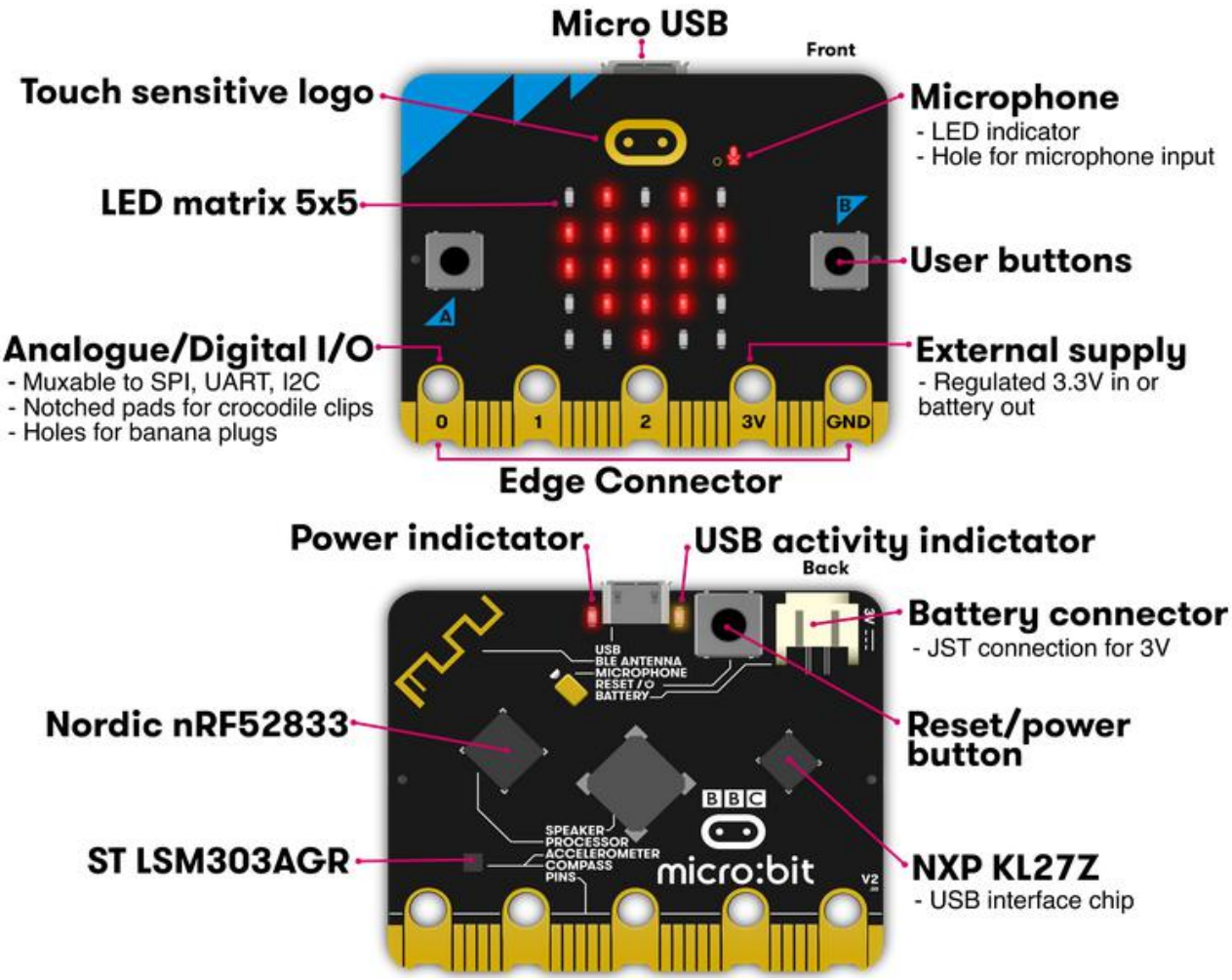
3. Preparation:

3.1. Micro:bit

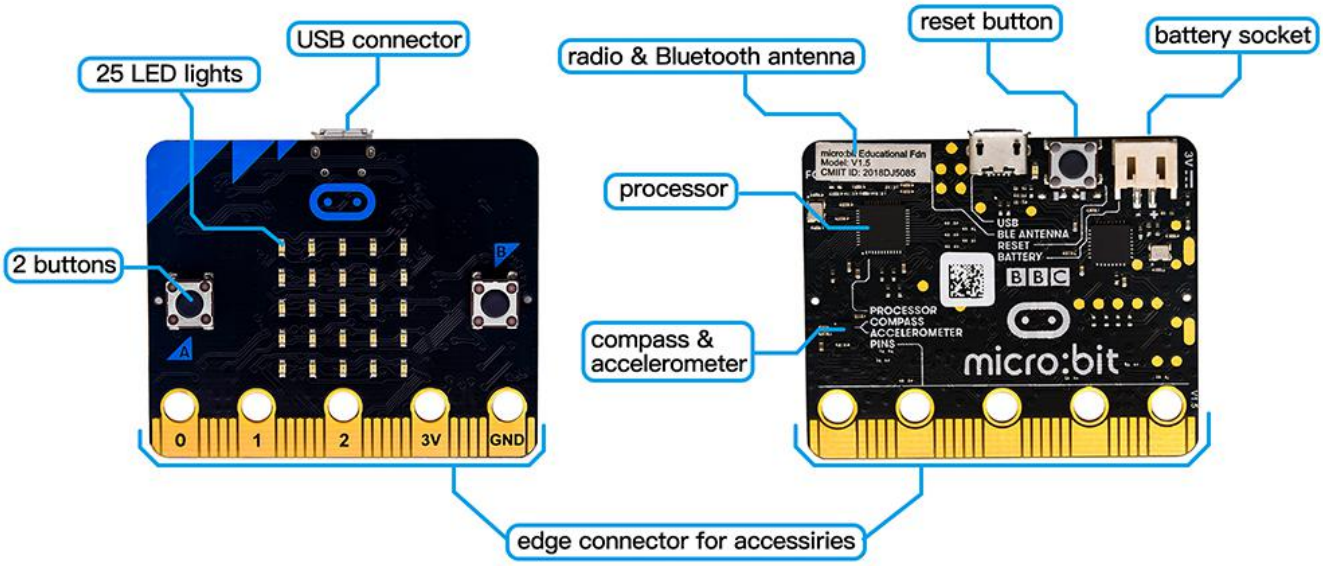
(1) What is micro:bit ?

Micro:bit is designed by BBC, aiming at helping children learning programming. Micro:bit includes a 5*5 LED dot matrix, 2 programmable buttons, compass, Micro USB port, Bluetooth module, etc. It is only half the size of a credit card (4cm×5cm), but very powerful. It can be used to edit video games, sound and light interaction, robot control, scientific experiments, wearable device and so on.

(2) Micro:bit Pinout:


Micro USB
Front
Touch sensitive logo
Microphone
- LED indicator
- Hole for microphone input
LED matrix 5x5
User buttons
Analogue/Digital I/O
- Muxable to SPI, UART, I2C
- Notched pads for crocodile clips
- Holes for banana plugs
External supply
- Regulated 3.3V in or battery out
0
1
2
3V
GND
Edge Connector
Power indictator
USB activity indictator
Back
Battery connector
- JST connection for 3V
USB
BLE ANTENNA
MICROPHONE
RESET / O
BATTERY
Nordic nRF52833
Reset/power button
SPEAKER
PROCESSOR
ACCELEROMETER
COMPASS
PINS
ST LSM303AGR
BBC
micro:bit
V2
NXP KL27Z
- USB interface chip

Micro:bit V2



Micro:bit V1.5

Micro:bit V1.5 VS Micro:bit V2

	V1.5	V2
PROCESSOR	Nordic Semiconductor nRF51822	Nordic Semiconductor **nRF52833**
MEMORY	256KB Flash, 16KB RAM	**512KB** Flash, **128KB** RAM
INTERFACECHIP	NXP KL26Z, 16KB RAM	NXP **KL27Z, 32KB** RAM
MICROPHONE	N/A	**MEMS microphone and LED indicator**
SPEAKER	N/A	**On board speaker**
TOUCH	N/A	**Touch sensitive logo**
EDGE CONNECTOR	25pins,PWM,I2C,SPI and Extension interface. 3 ring pins for connectin crocodile clips/banana plugs.	
	3 dedicated GPIO	**4 dedicated GPIO Notched for easier connection**
I2C	Shared (mux) I2C bus	**Dedicated I2C bus**
WIRELESS	2.4GHz Radio/BLE Blutooth 4.0	2.4GHz Radio/BLE **Blutooth 5.0**
POWER	Micro USB 5V power supply, 3V port or battery power supply	Micro USB 5V power supply, 3V port or battery power supply **LED Indicator, Power off (push and hold power button)**
CURRENT AVAILABLE	90mA	**200mA**
MOTION SENSOR	ST LSM 303	
PROGRAMMING SOFTWARE	C++, Makecode, Python, Scratch	
SIZE	5cm(W) x 4cm(H)	

You can reboot micro:bit V2 when pressing reset and power button.

LED will get dark and the power-saving mode will be activated if you keep

pressing reset and power button, which can make the life expectancy of batteries longer and activate micro:bit.

More resources:

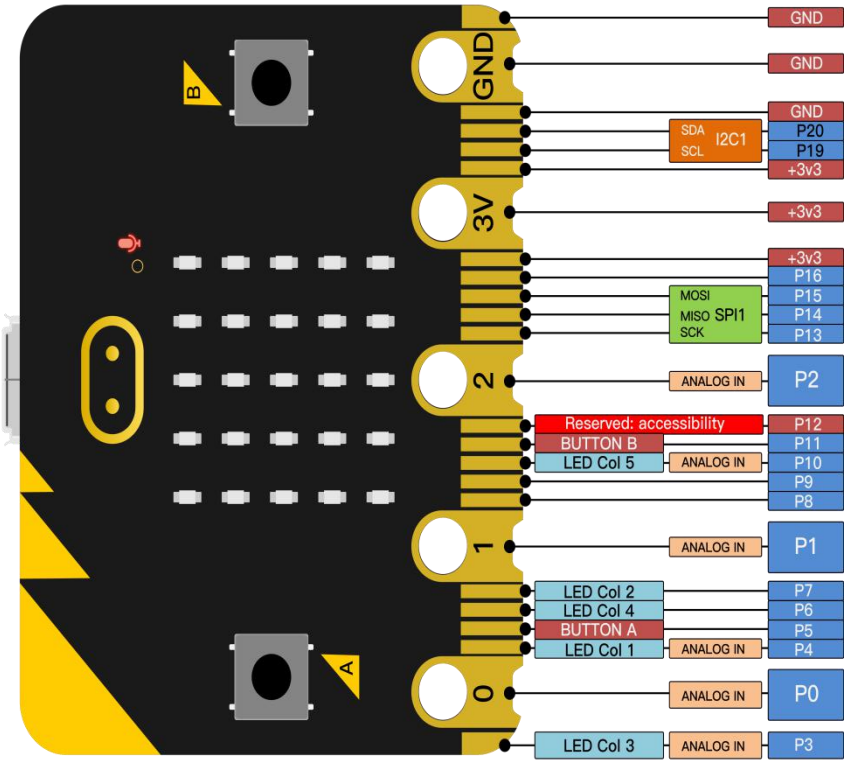
https://tech.microbit.org/hardware/

https://microbit.org/new-microbit/

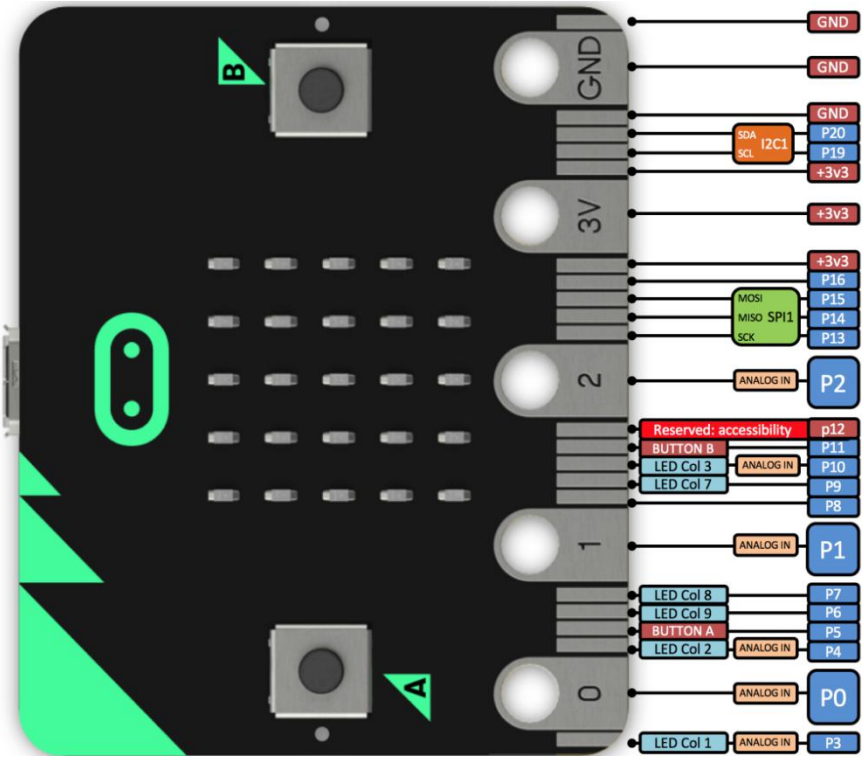
https://www.microbit.org/get-started/user-guide/overview/

https://microbit.org/get-started/user-guide/features-in-depth/

Micro:bit Pinout



V2



V1.5

Official website:

https://tech.microbit.org/hardware/edgeconnector/

https://microbit.org/guide/hardware/pins/

Note:

a. Put it on with silicone case to prevent the short circuit due to electronic components on micro:bit V2

b. Don’ t interface it with high current components(such as servo MG995, DC motor) because of weak driving ability (less than 300mA)of IO port of micro:bit V2, otherwise, it will be burned out.

We recommend you to work with micro:bit expansion board before using it.

c. We supply power via USB port or 3V port of micro:bit V2. However, the micro:bit shield is needed if you use 5V sensor because its voltage is 3V.

d. Remember to disable(you can use this block to disable the pin 

)the common pins of micro:bit like P3, P4, P6, P7 and P10 in the code, otherwise, the data will be wrong.

e. The battery above 3.3V is not allowed to be used, otherwise, micro:bit V2 will get damaged.

f. Don’ t put it on the metal object to avoid short circuit.

Online Makecode editor: https://microbit.org/code/

3.2. Install the Driver of Micro:bit

The installation of driver wouldn't be needed, if you already installed it.

But, you need to install the driver of micro:bit if it’ s your first time to use micro:bit.

Download link: https://fs.keyestudio.com/KS4013-4026

You could download driver file (mbed_usb_2020_x64_1212.exe) in the 2. Microbit Driver folder.

4. Programming:

We will take Windows system as example.

4.1 Quick Start:

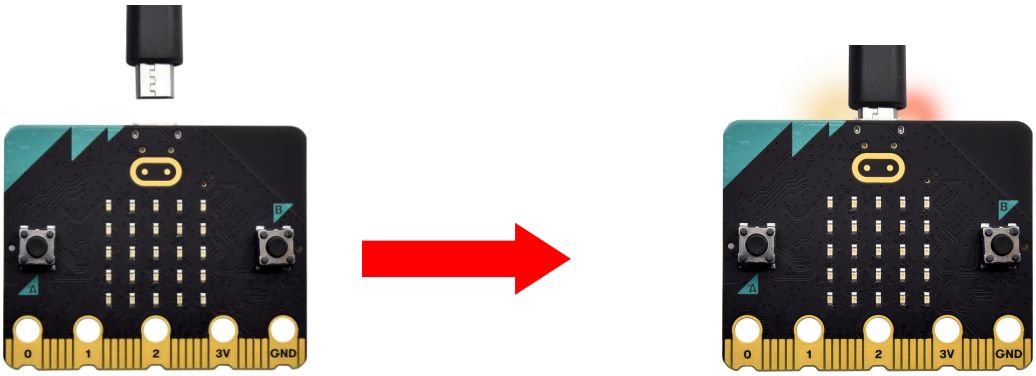
This chapter introduces how to program and download code to micro:bit V2. There are detailed tutorials in the official website, as shown below:

https://microbit.org/guide/quick/

Step 1: Connect Micro:bit V2

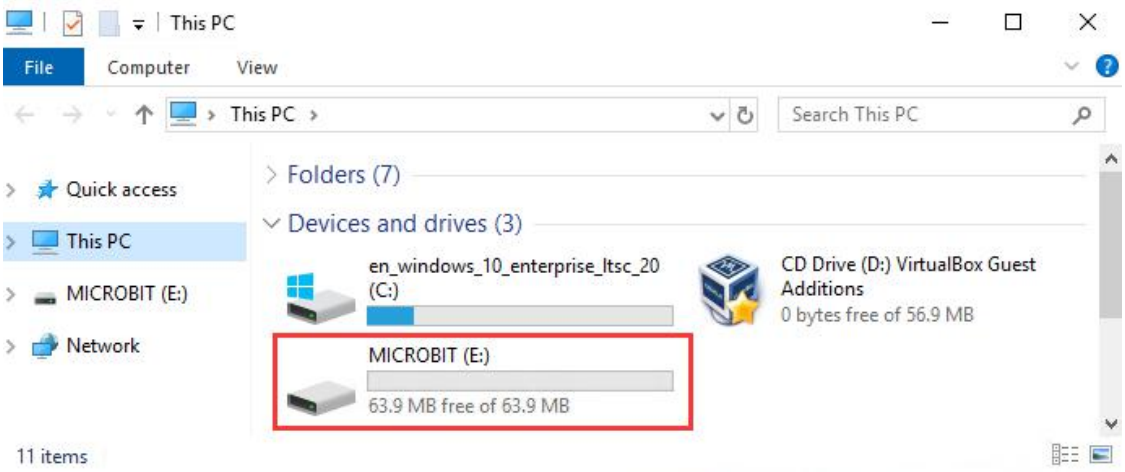
Interface micro:bit with your computer using USB cable.（Guide to mobile & tablet apps：https://microbit.org/get-started/user-guide/mobile/).

Macs , PCs, Chromebooks and Linux system（including Raspberry Pi) support micro：bit V2.



After connecting it to computer, red LED of micro:bit V2 will be on.

There will be a MICROBIT drive in your computer, as shown below:



Step 2: Programming:

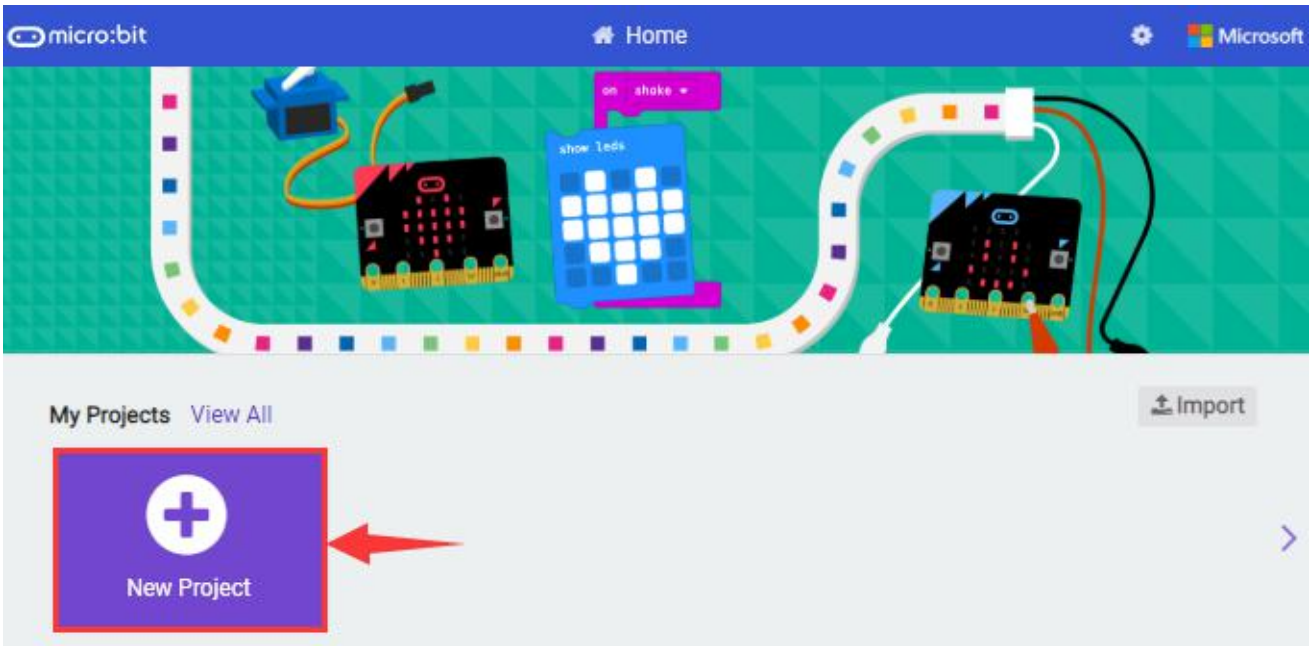
Enter https://makecode.microbit.org/ (we recommend you to use Google Chrome), then click 

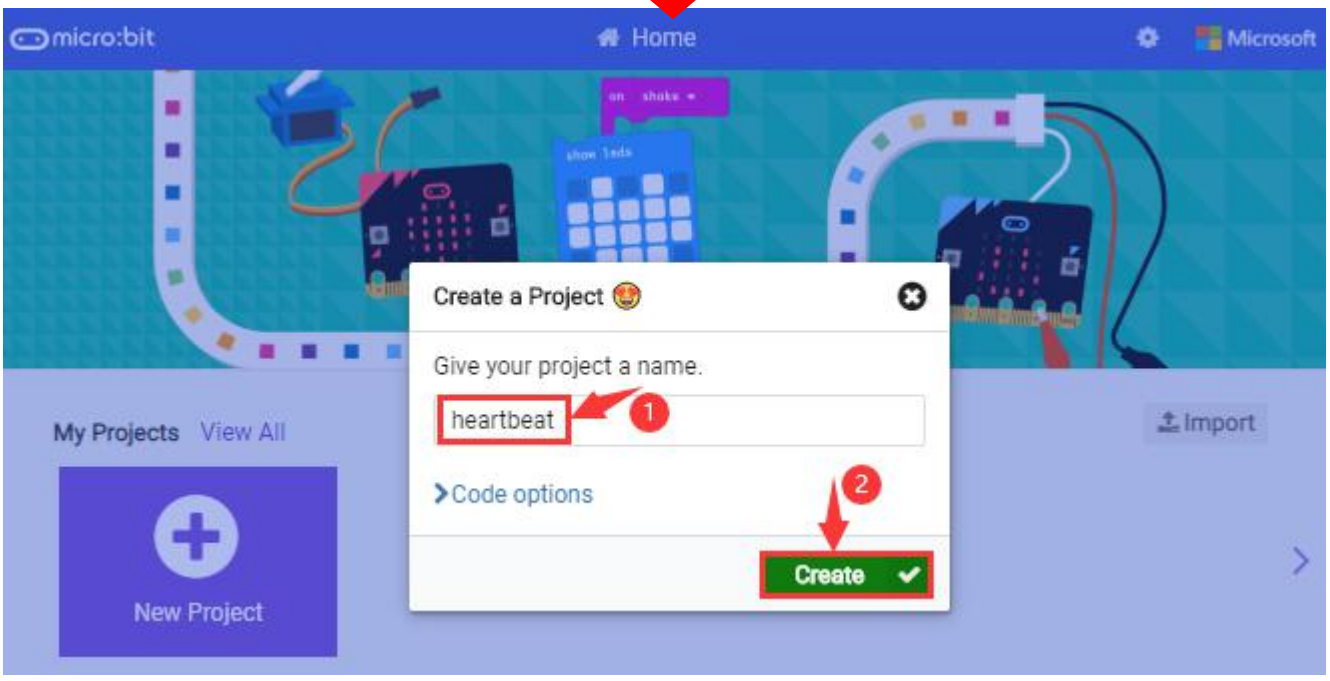
and you will view a dialog box.

Input "heartbeat" to name your project and click "Create"

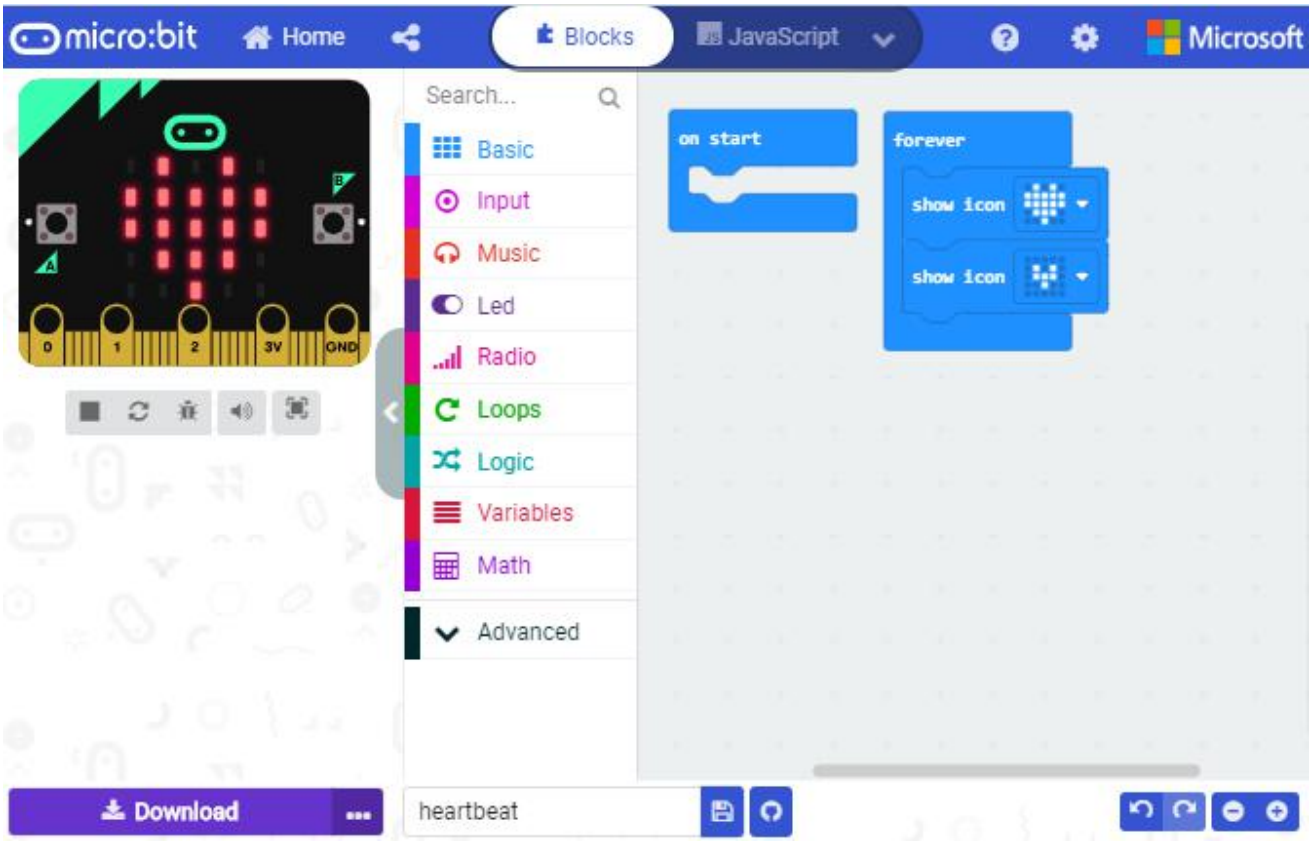
You could download Makecode app if your system is Windows 10:

https://www.microsoft.com/zh-cn/p/makecode-for-micro-bit/9pjc7sv48lcx?ocid=badgep&rtc=1&activetab=pivot:overviewtab





Through MakeCode editor, you just need to drag blocks from block area into code editing area to program. Then run this code, as shown below:



Step 3: Download Code:

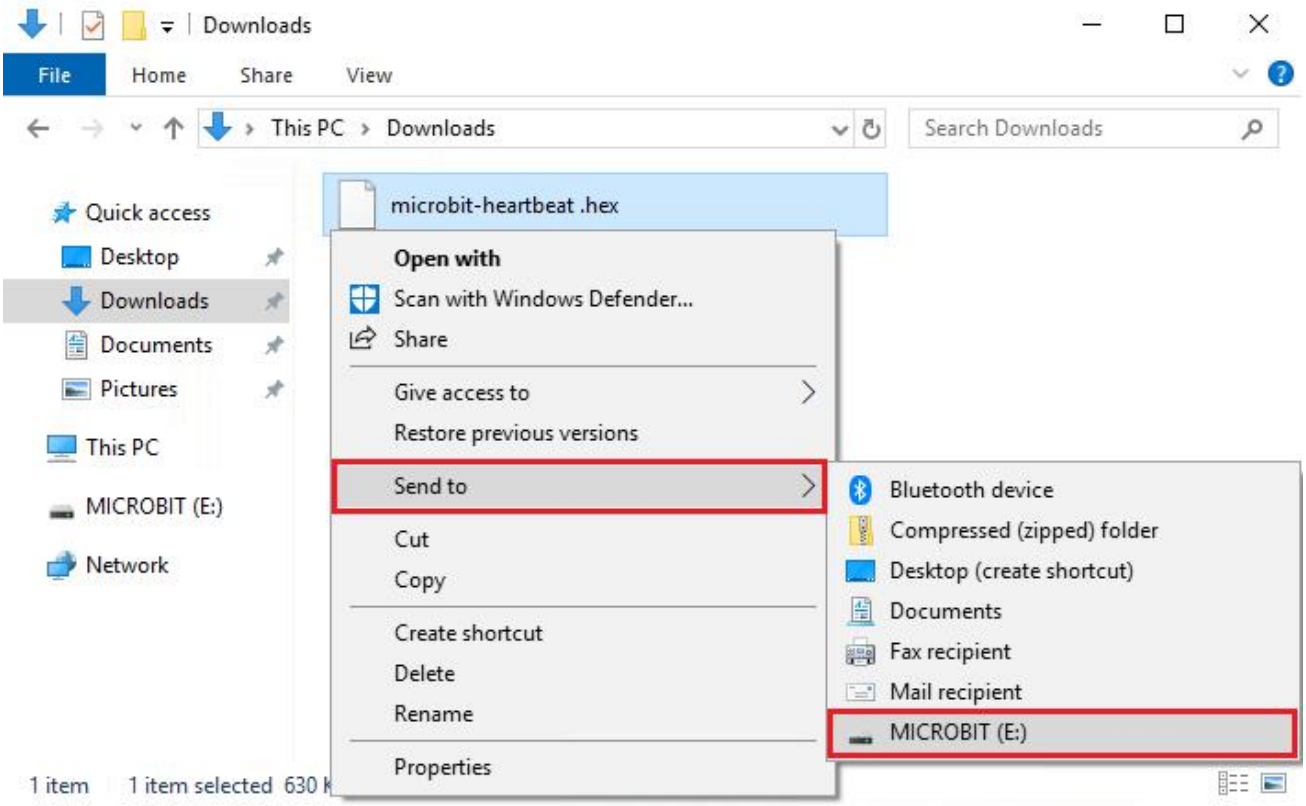
The code can be directly downloaded to micro:bit V2 if you tap "Download" icon on makecode App.

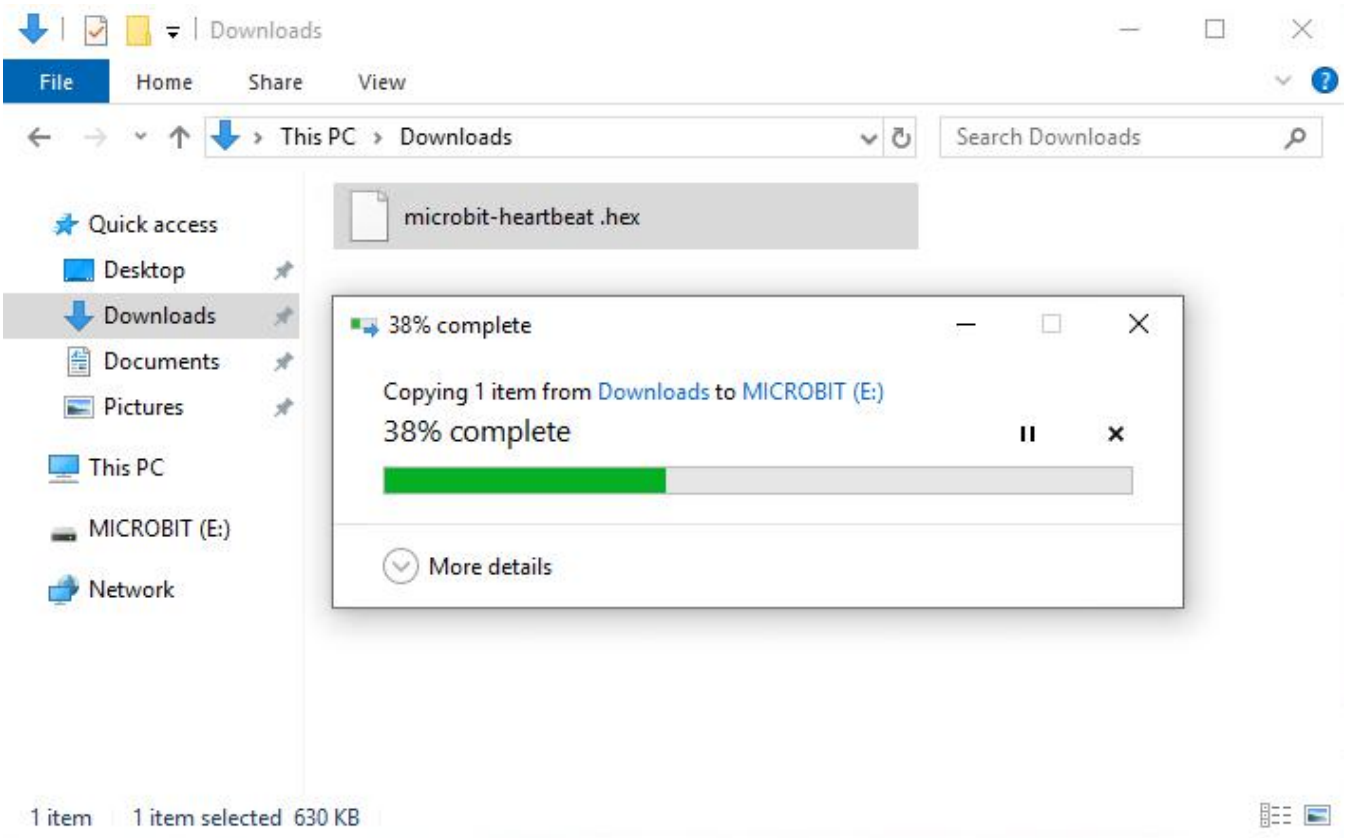
However, follow the steps below if you program via online makecode editor.

Enter online Makecode editor, tap "Download" to get a "hex" file. Then copy it into MICROBIT drive.

Or you could find out "hex" file firstly and right-click to select "Send to" MICROBIT (E) " .

Then hex file will be copied on MICROBIT drive.



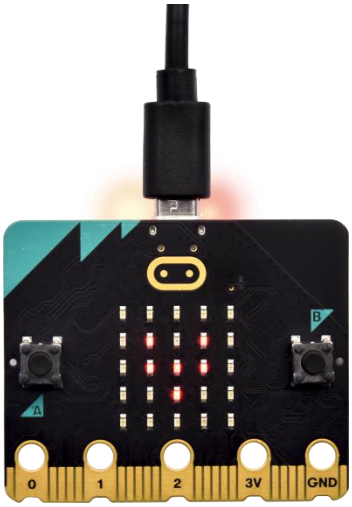


The yellow indicator will flash when transferring "hex" into micro:bit V2. And it is solid on after the file is copied.

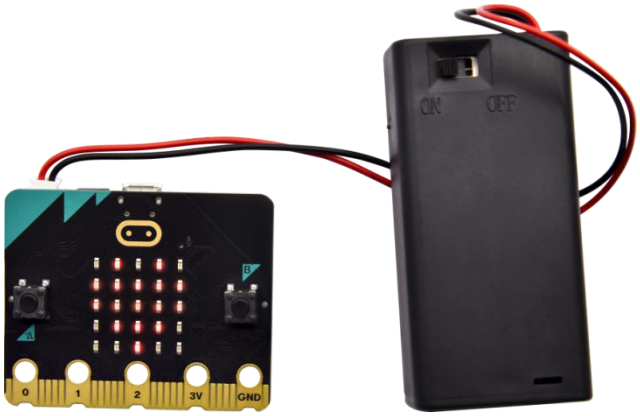
Step 4: Run Program:

Download code to micro:bit V2 and plug in power with USB cable.

5 x 5 LED will show heartbeat pattern.



Power Supply-----micro USB



external power（3V）

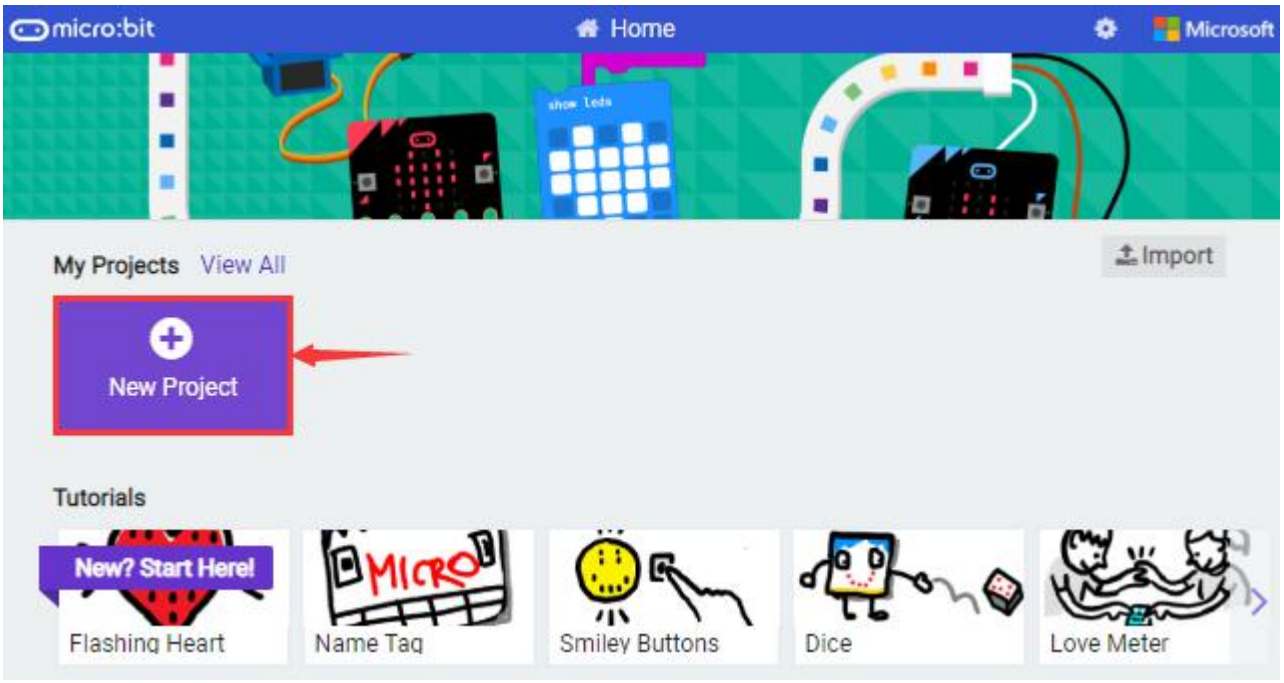
You can edit the code in other ways:

https://microbit.org/code/

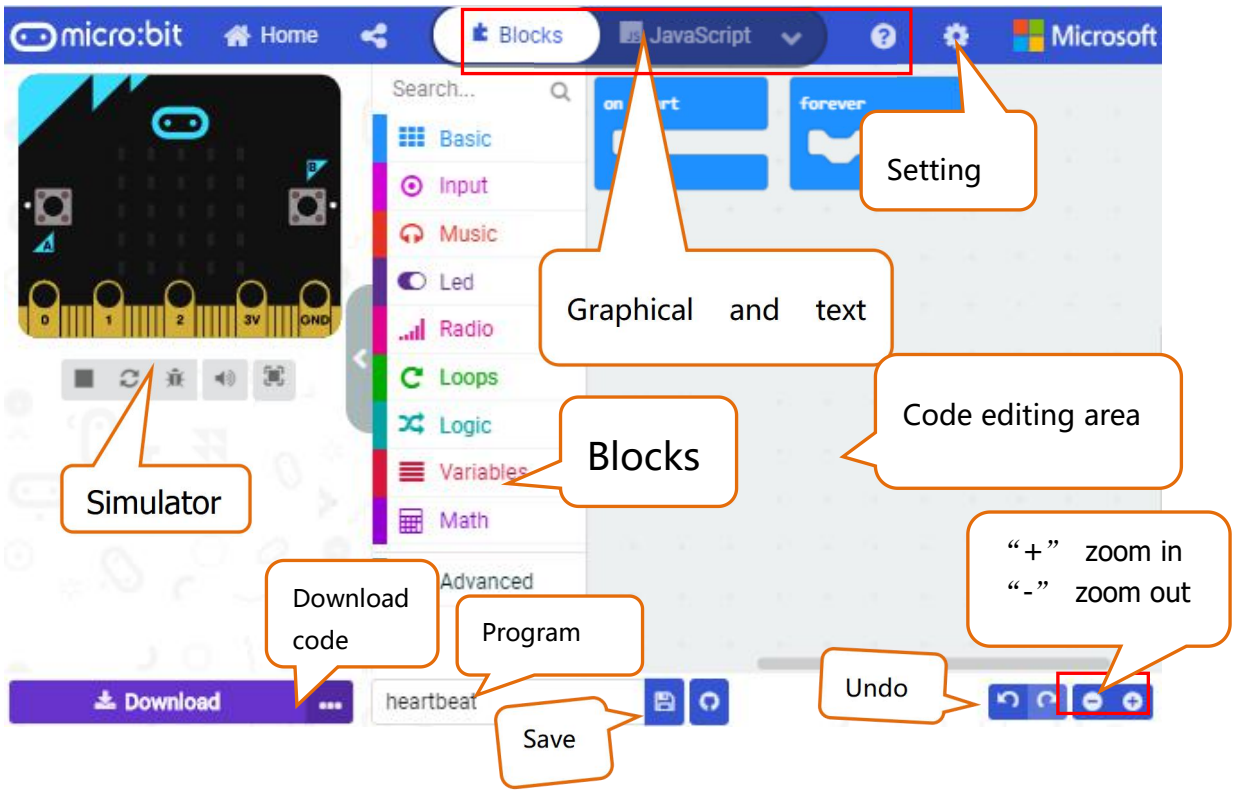
https://microbit.org/projects/

4.2. Makecode：

Navigate https://makecode.microbit.org/ on Google Chrome, and enter online makecode editor. Perhaps, you can open makecode app for Windows 10.



Click "New Project", input "heartbeat" and enter Makecode editor, as shown below:



There are block “on start” and “forever” in the code editing area.

After power on or reset, “on start” means that command blocks in the code are only executed once, however, “forever” implies that code runs cyclically.

4.3. Quick Download:

You can click “download” to transfer code to micro:bit V2 if you use makecode App for Windows 10.

Whereas, the online Makecode editor requires intricate steps.

Operating Google Chrome on Android, ChromeOS, Linux, macOS or Windows 10 system, you can achieve the quick download.

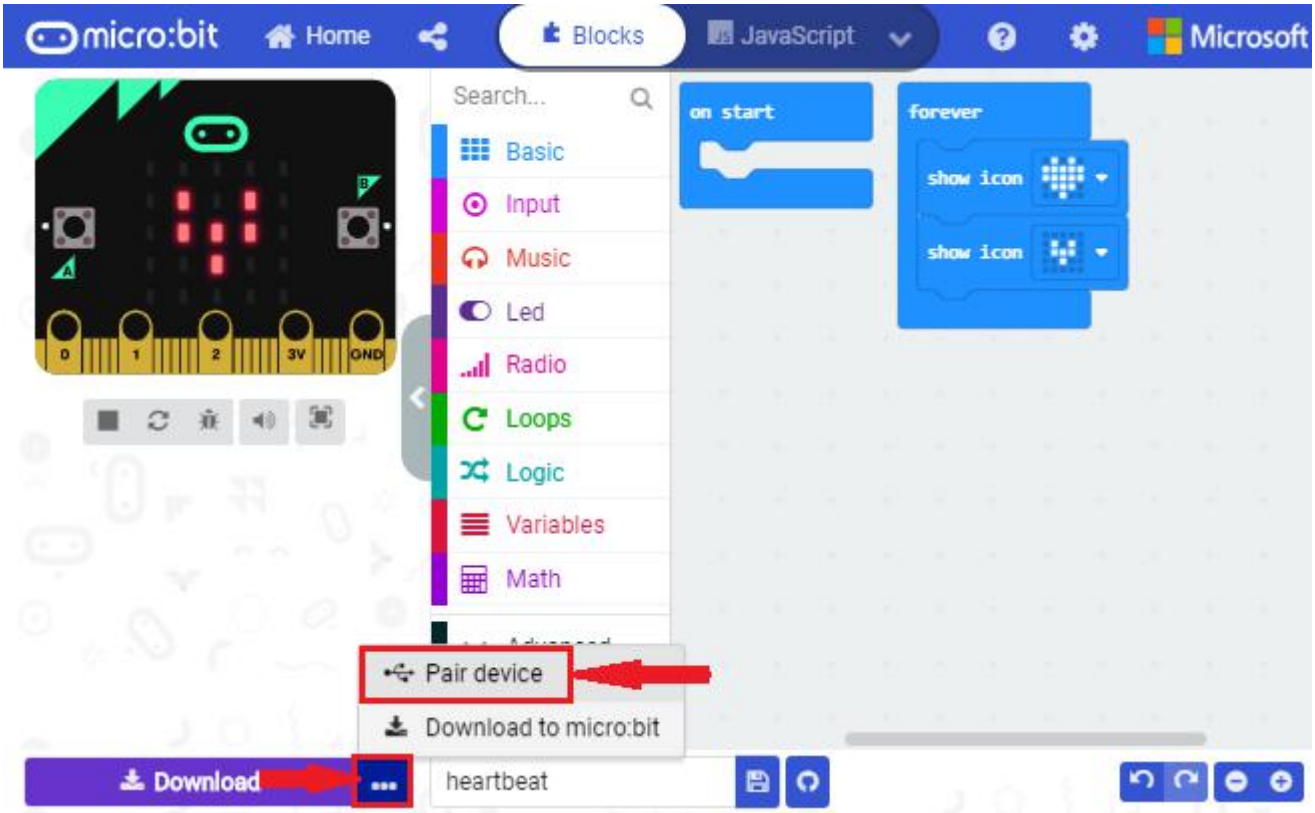
We use the webUSB function of Chrome to allow the internet page to access the hardware device connected USB.

You can refer to the following steps to connect and pair device.

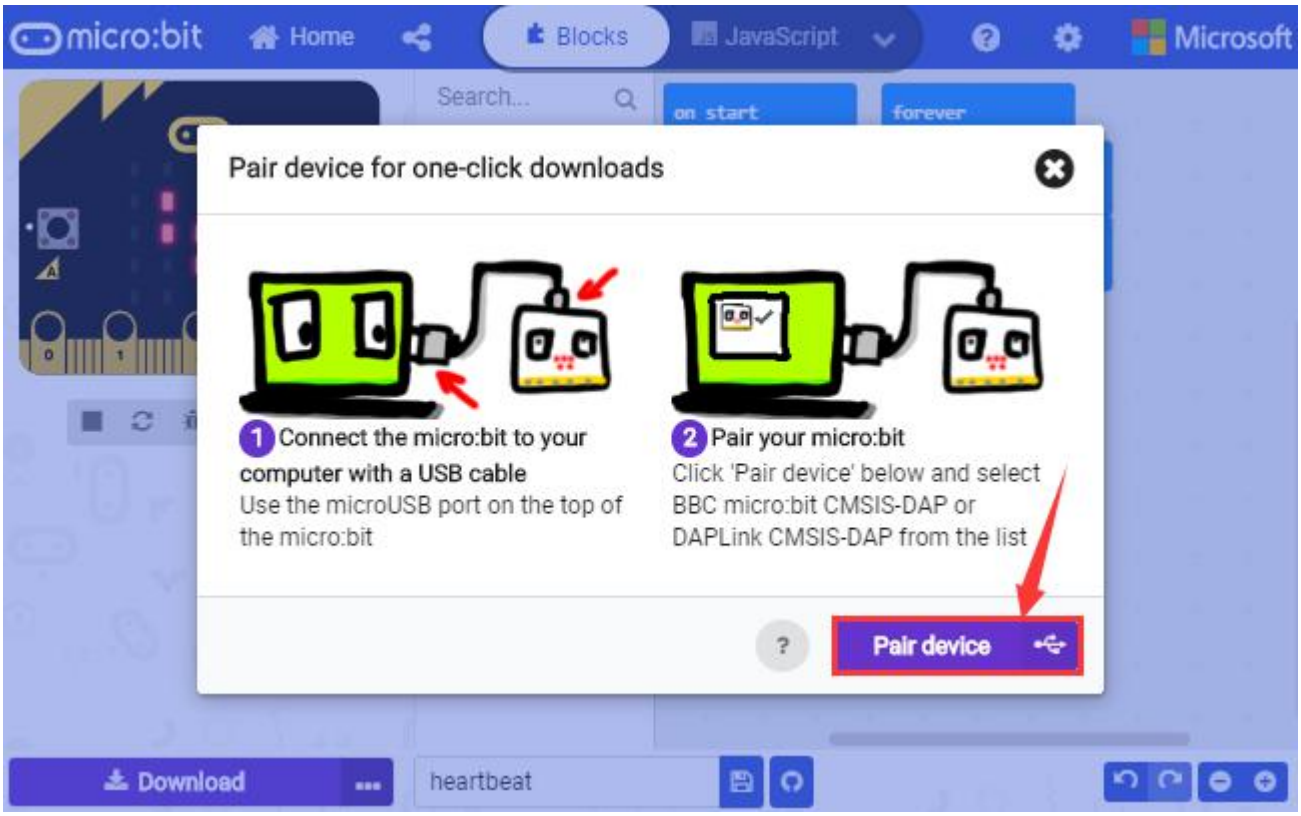
Pairing Device:

Interface micro:bit V2 with computer using USB cable.

Click “...” beside “Download” and tap “Pair device”.



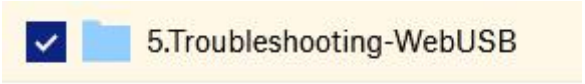
Continue to tap “Pair device”



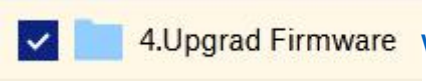
Then select the device you want to connect and tap "connect" in the window.

If there is no device in the window, please refer to the following link:

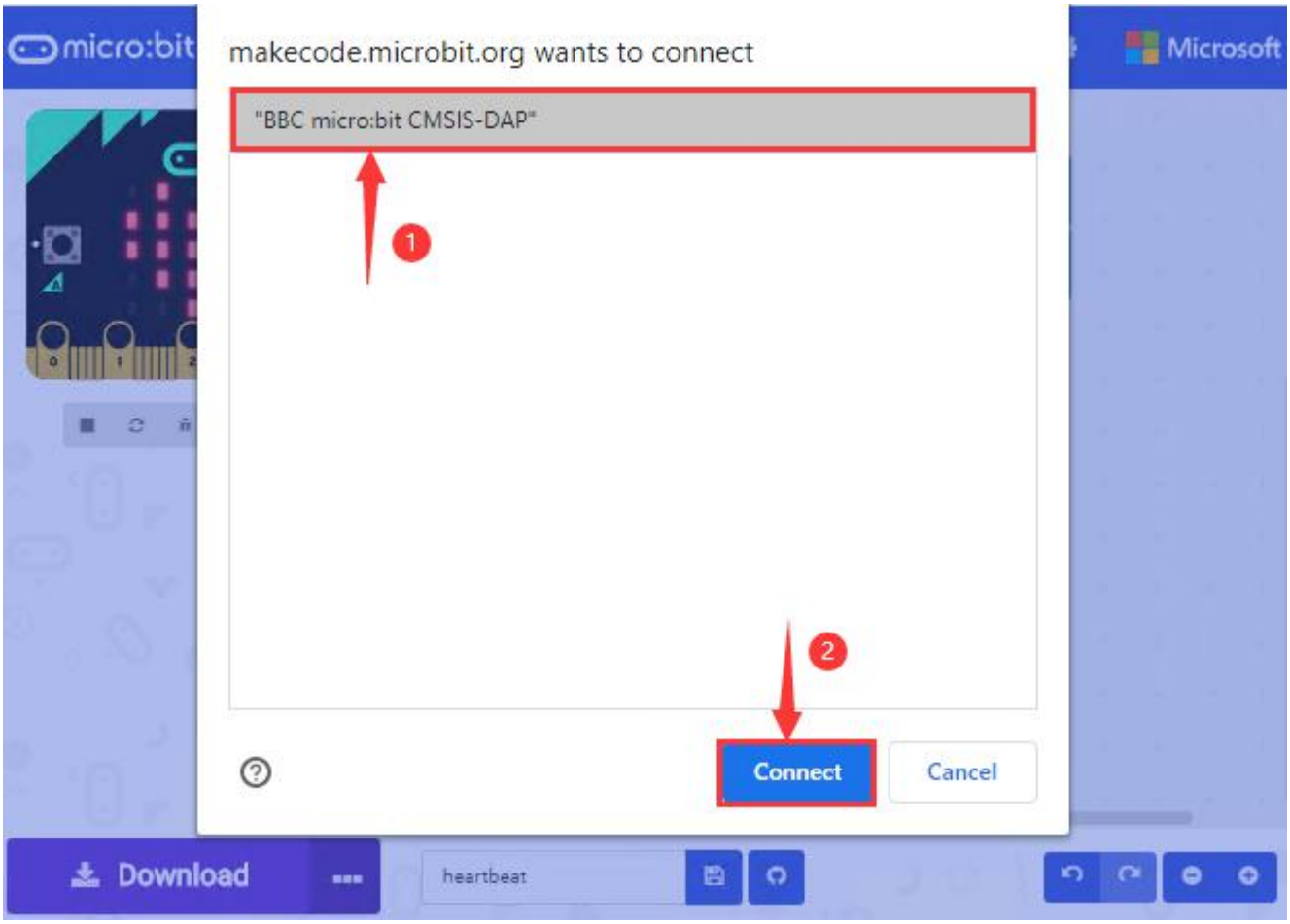
https://makecode.microbit.org/device/usb/webusb/troubleshoot

We also provide 

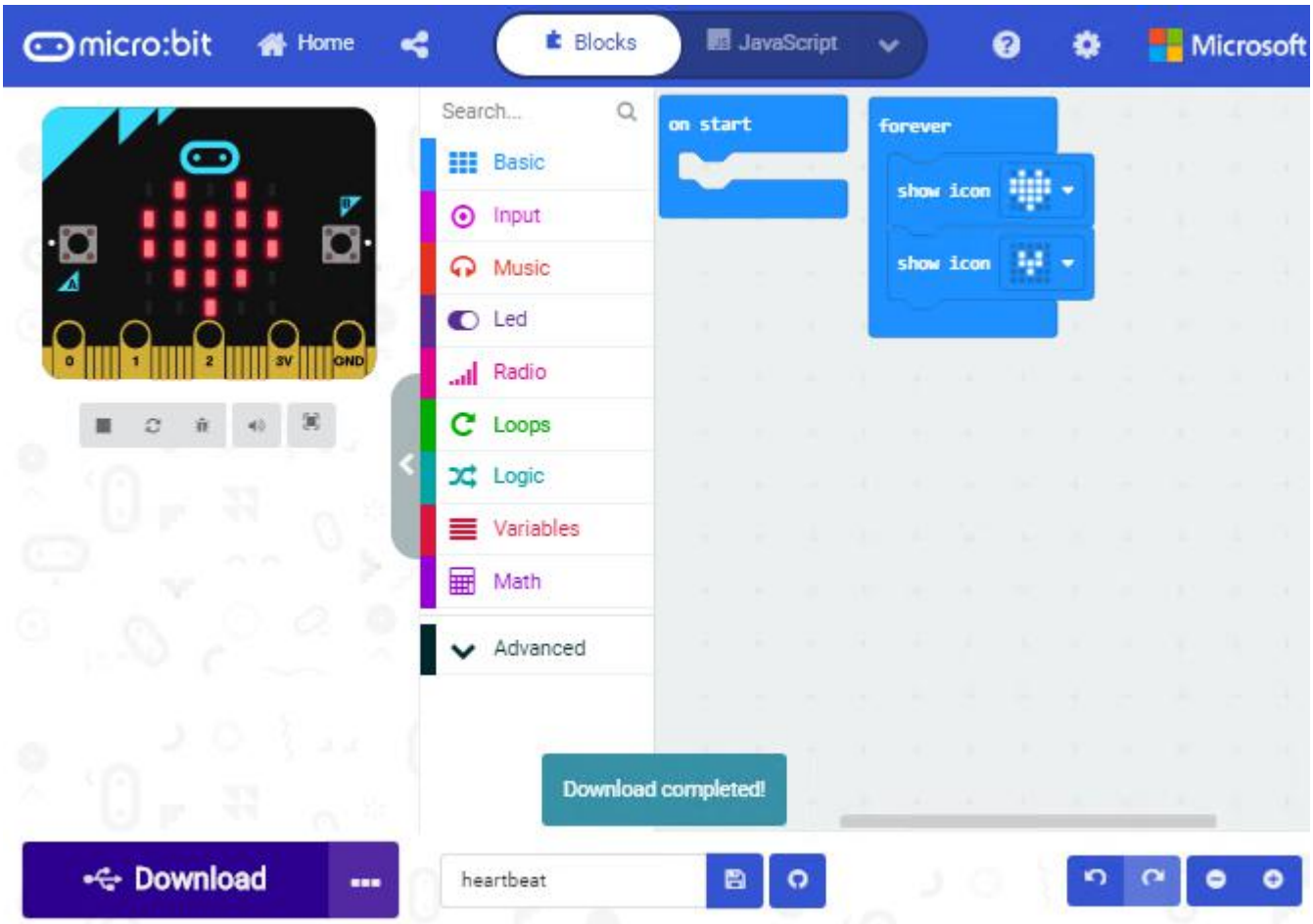
in the resource link.

What's more, if you don't know how to update the firmware of micro:bit, refer to the link: https://microbit.org/guide/firmware/ or browse folder 

we provide.



After connecting successfully, press buttons and download code to micro:bit V2.

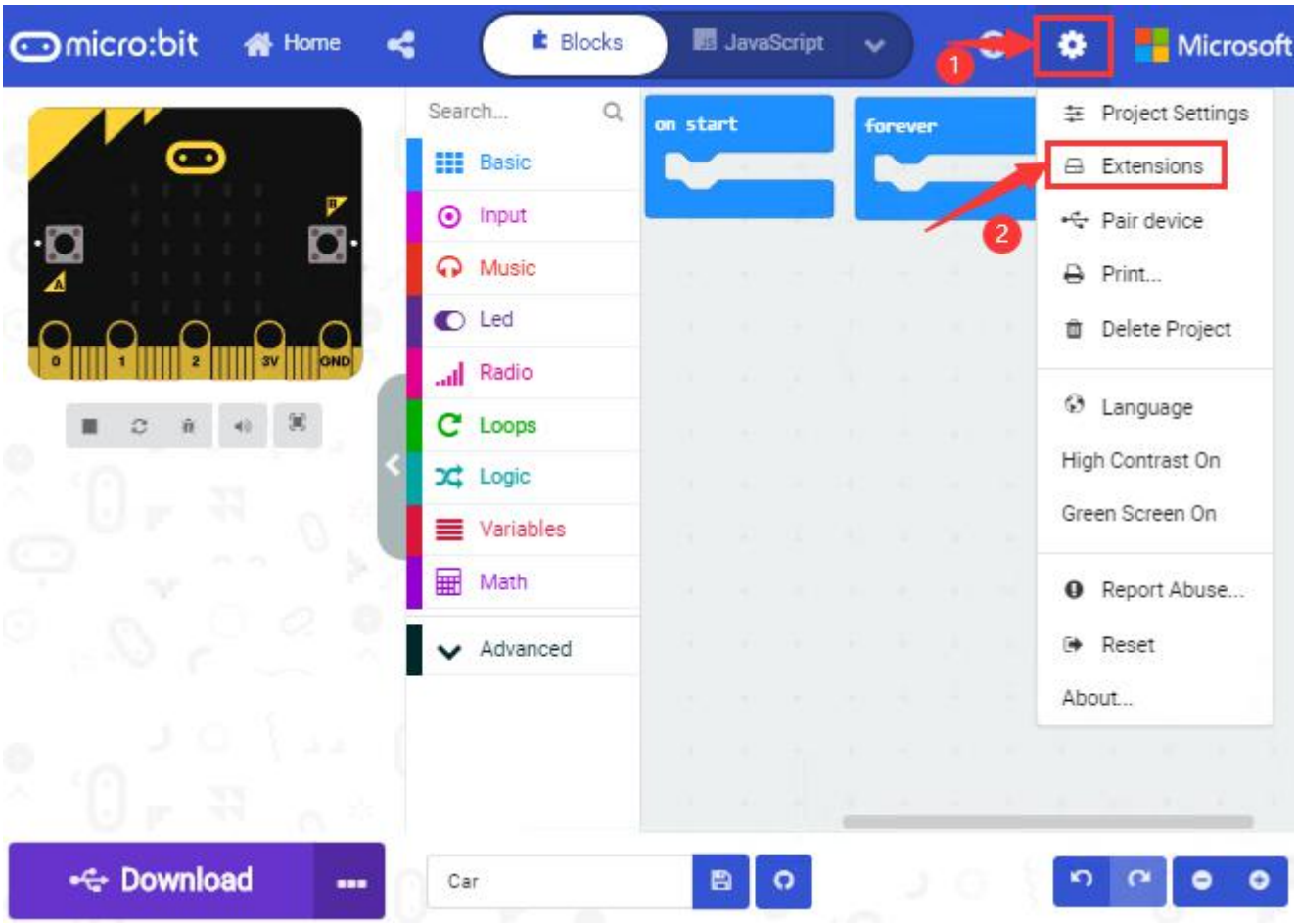


4.4. How to Import Extension Library

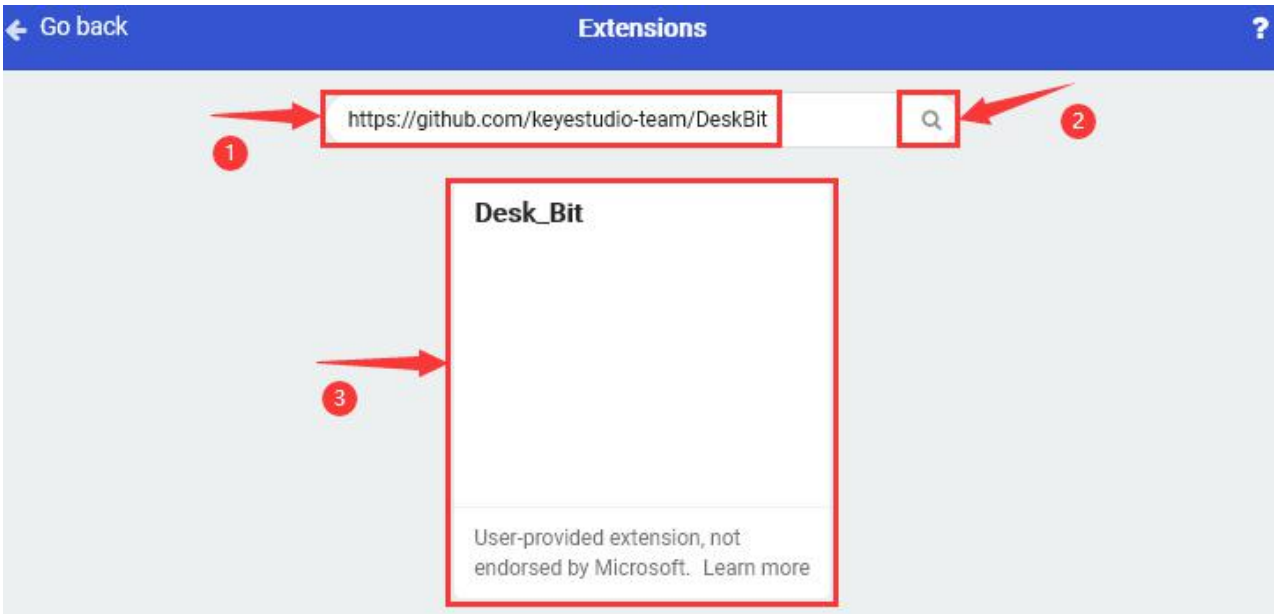
Next, we need to import Desk Bit extension library for further lessons.

Add a Desk Bit extension library

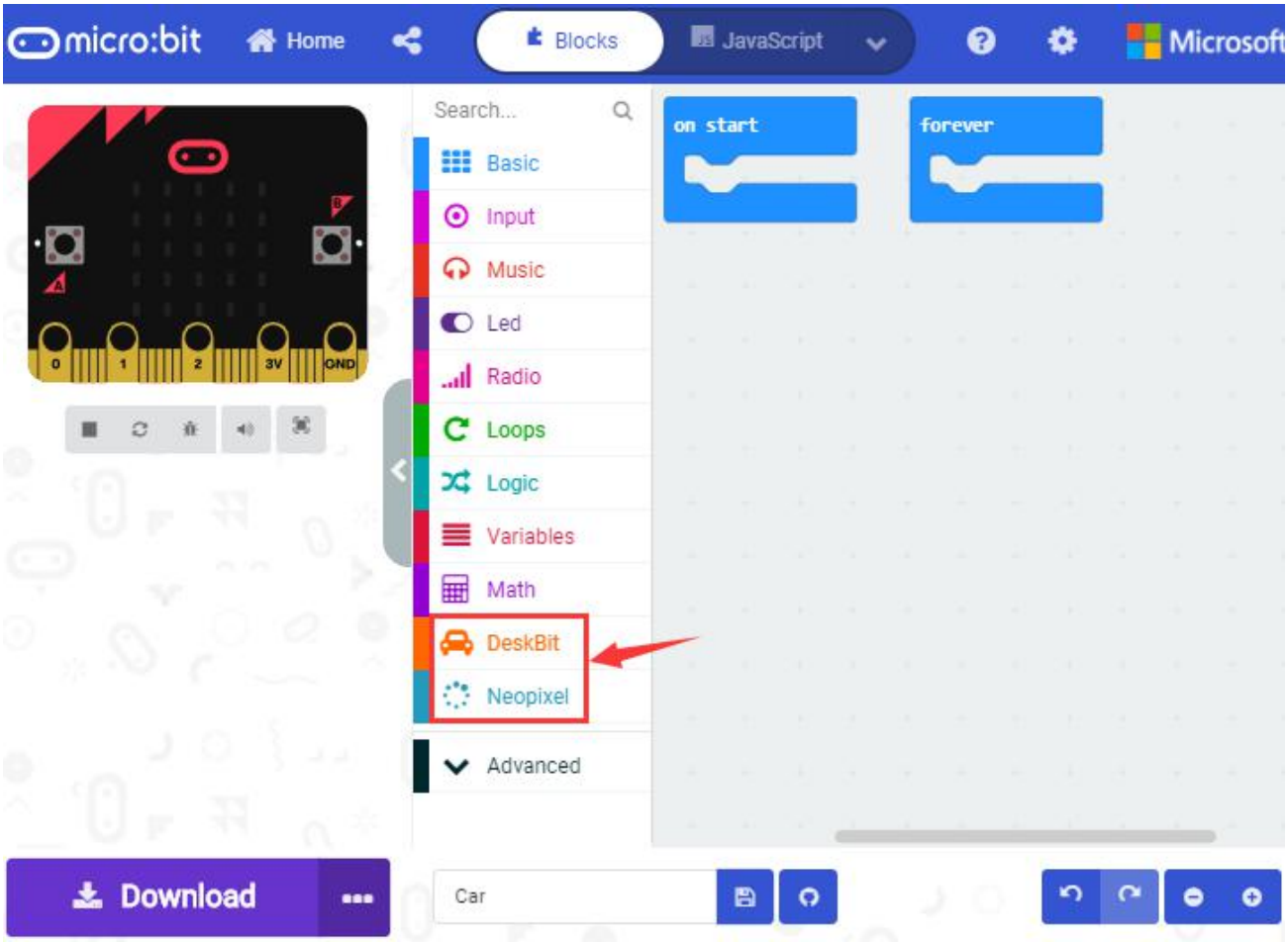
Enter Makecode editor and click  icon and tap 

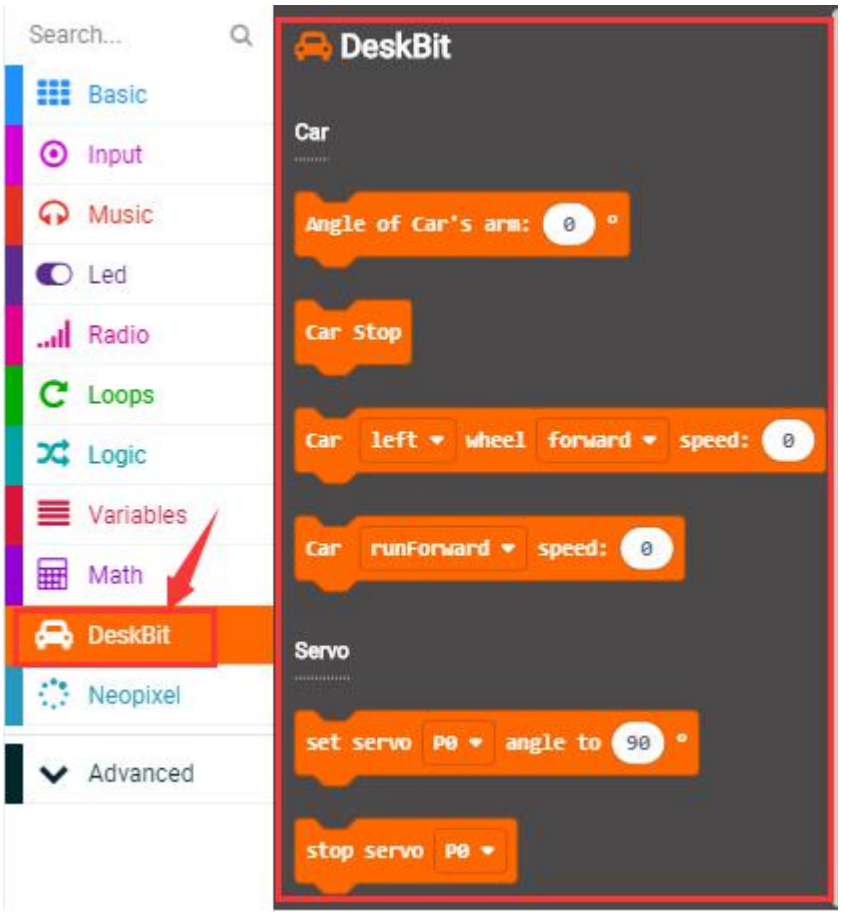


Copy https://github.com/keyestudio-team/DeskBit in the searching box to search desk bit extension library.



After the installation, “Desk Bit” extension library will appear in the page, and download Neopixel extension library.





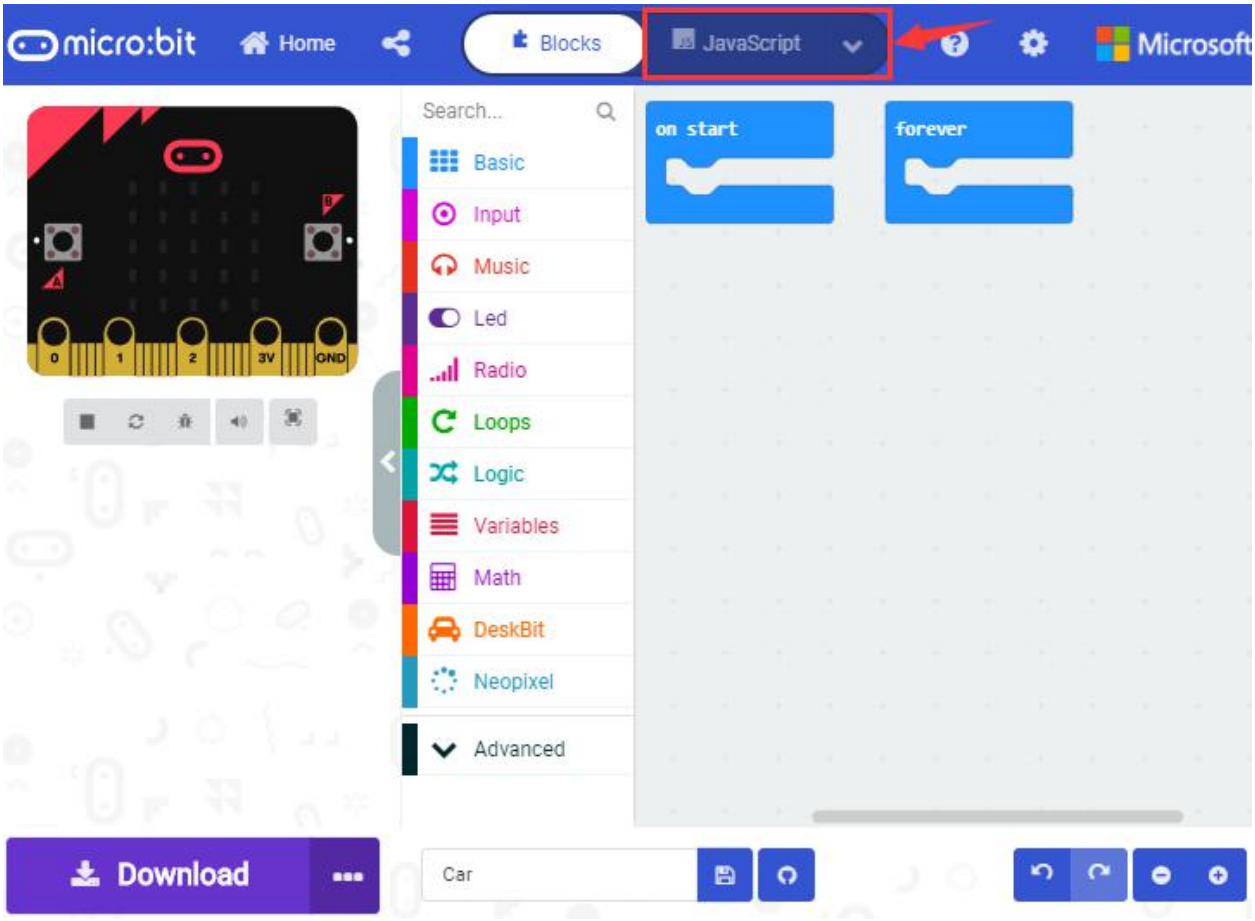
Note: the extension library added is only valid to one project, therefore, it won’ t appear in other projects.

You need to import Desk Bit extension library again when creating new projects.

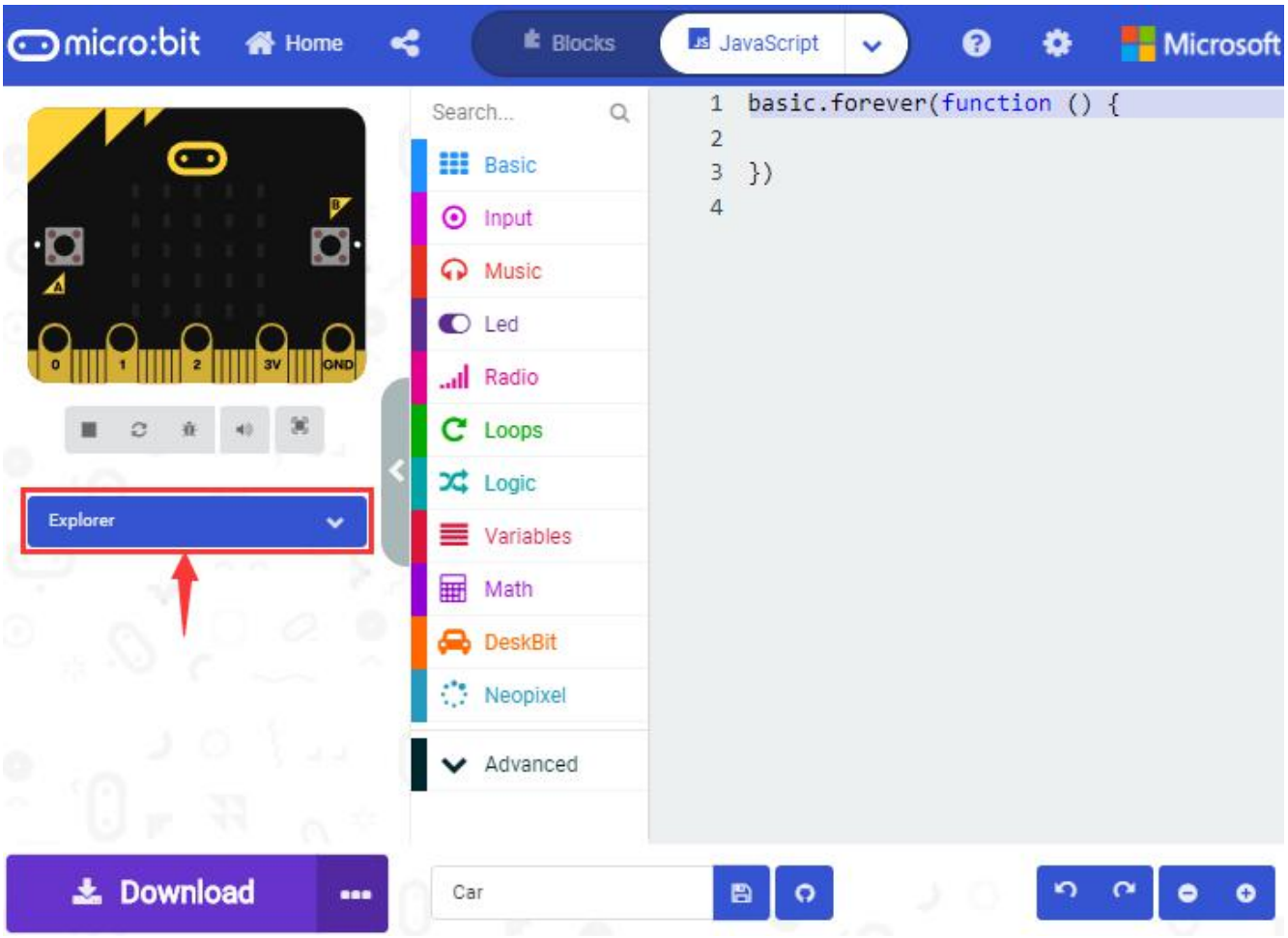
Update or Delete Desk Bit Extension Library

Refer to the following instruction please, if you intend to update or delete Desk Bit extension library.

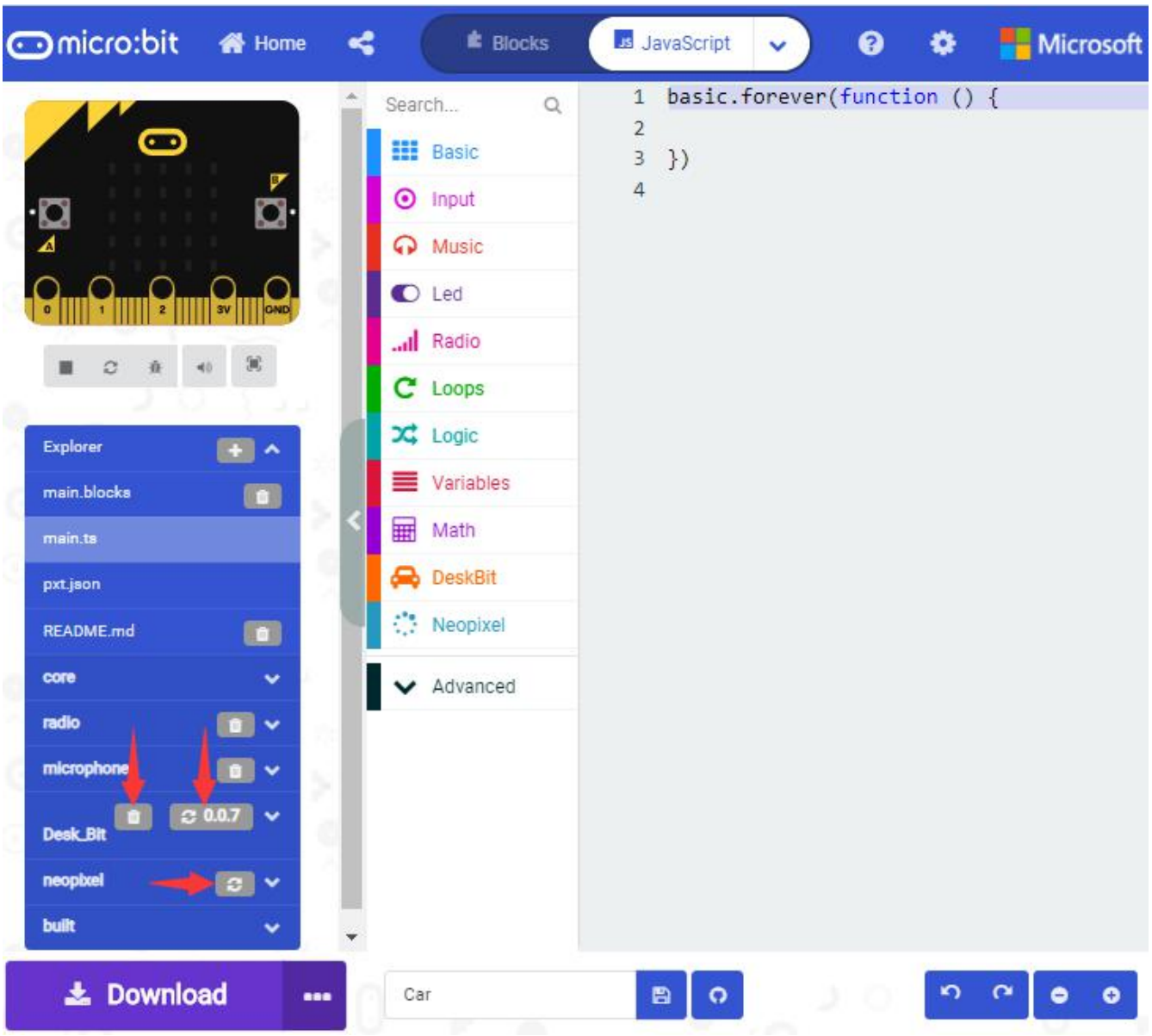
Click "Js JavaScript" button to switch into text code



Click “Explorer” to get extension library .



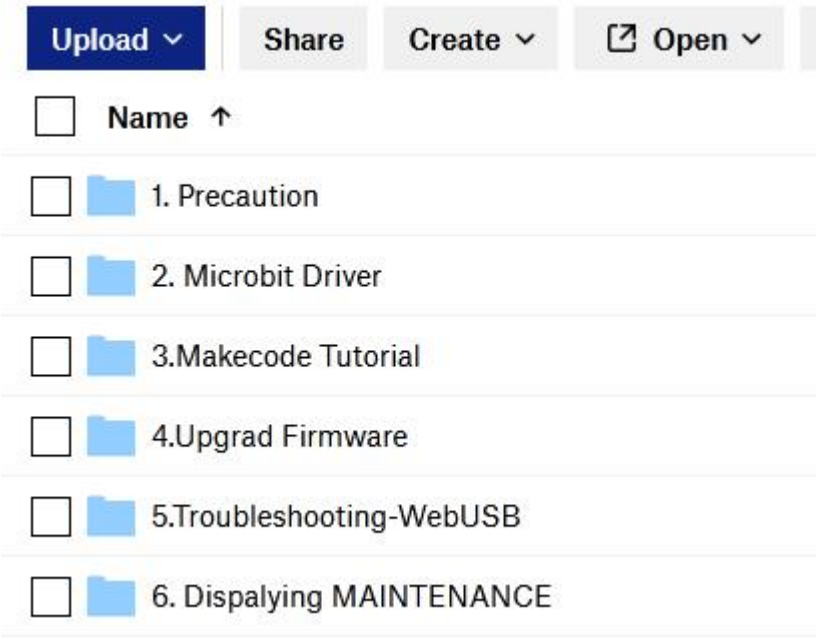
Click " pxt-k-bit " to delete Desk Bit and Neopixel extension libraries; next to tap " pxt-k-bit e8e1f65 " to update Desk Bit and Neopixel extension files.



4.5. Resources and Code

Download Link: https://fs.keyestudio.com/KS4013-4026

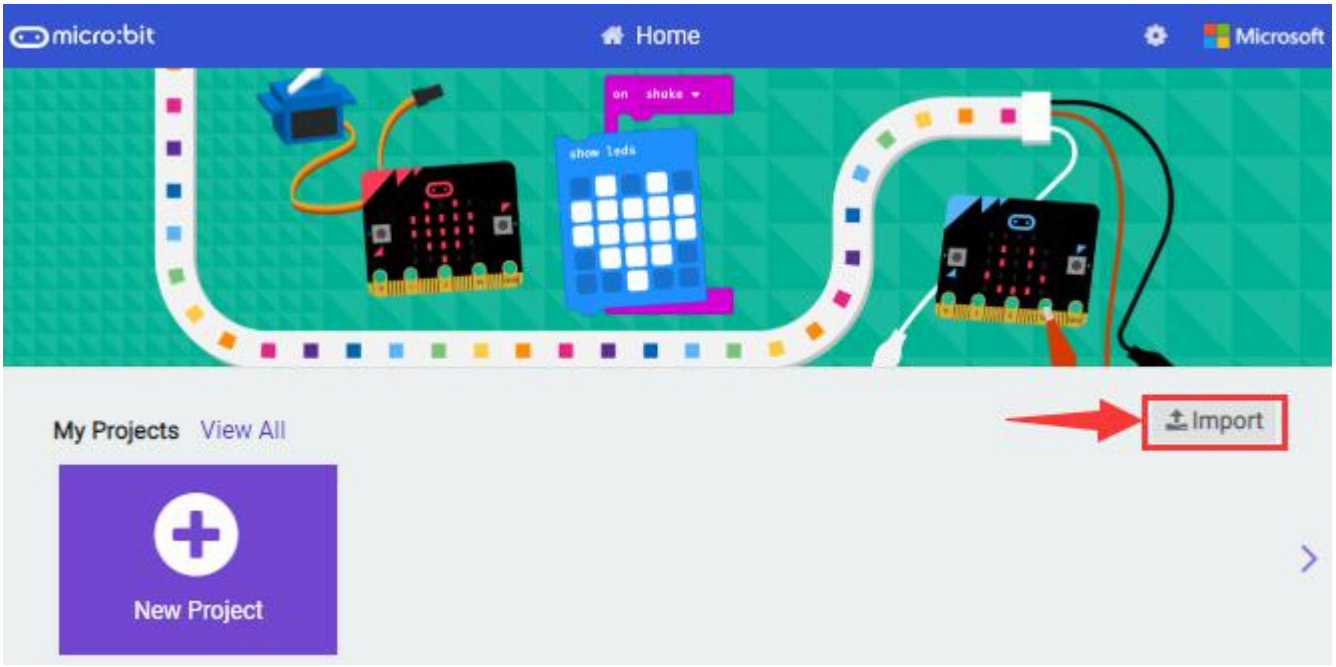
After downloading the tool package, you can open a file named KS4013 (KS4026)Keyestudio Micro：bit Desk Bit car. It can be placed everywhere in your computer. Open the file and you will find following files:



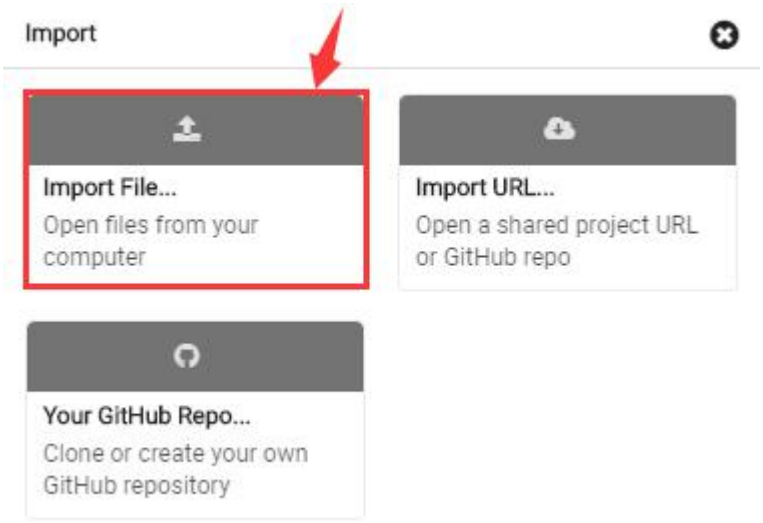
4.6. Import Code：

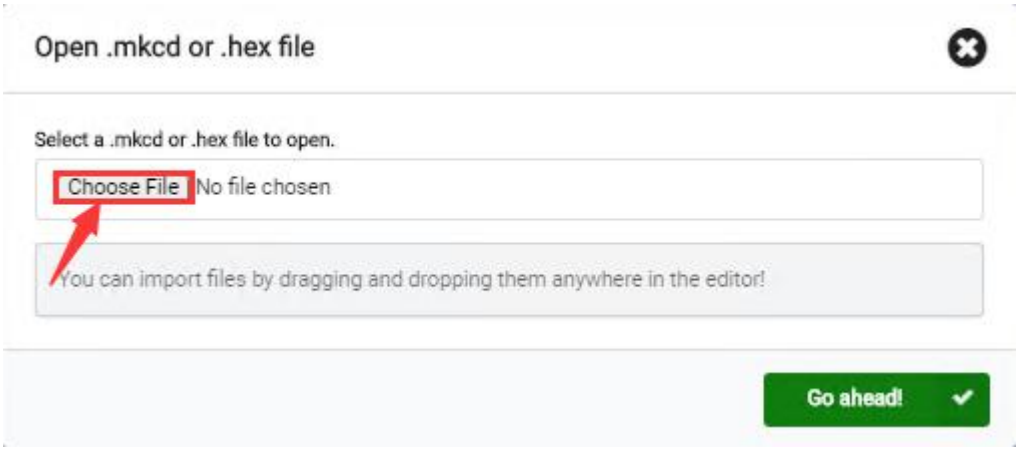
We provide every program with hex file. You can import it directly or program in Makecode blocks area, therefore, the extension library must be added.

Next, we will take “heartbeat” as example to introduce how to import code. Open online Makecode editor or Makecode App.

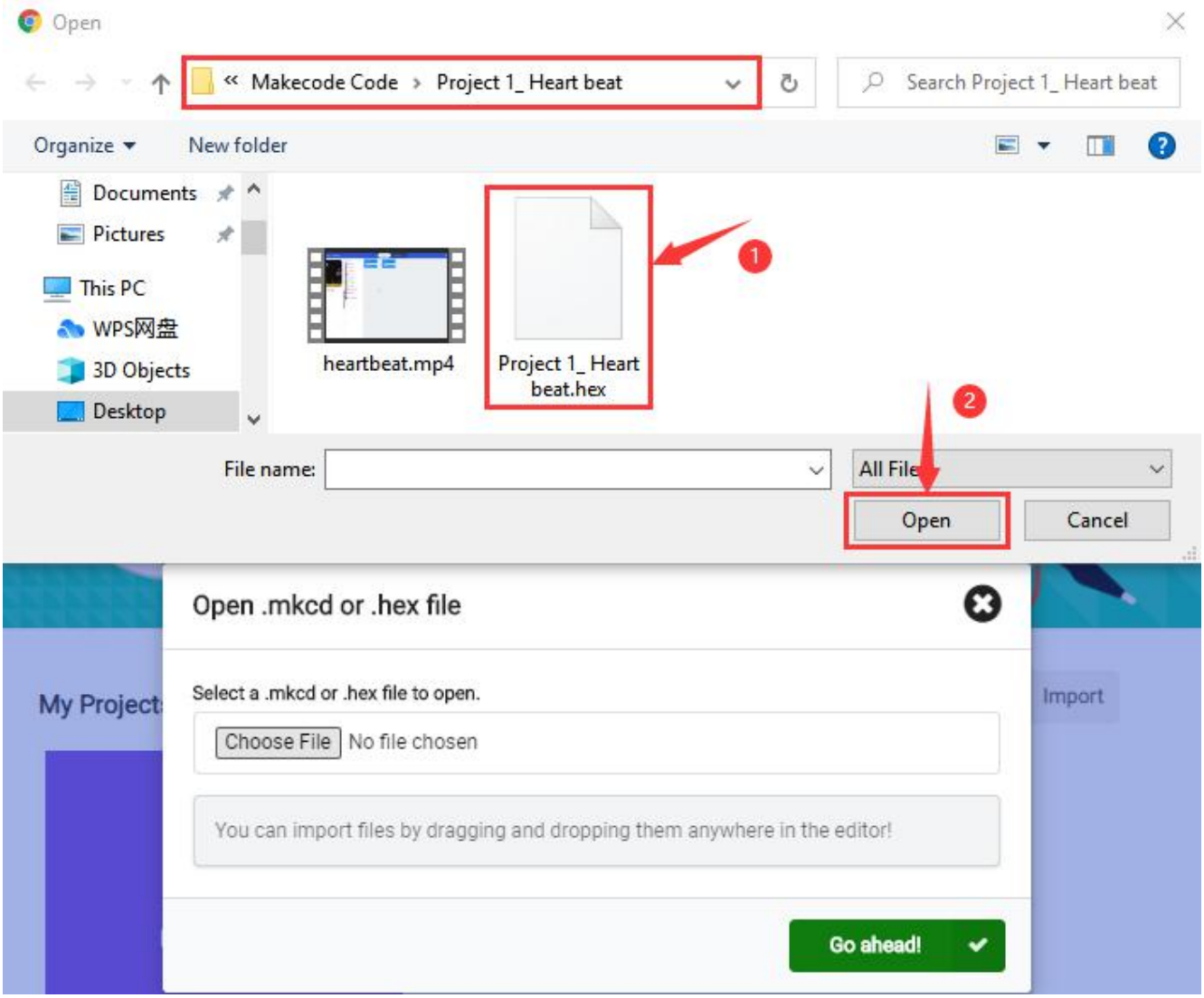


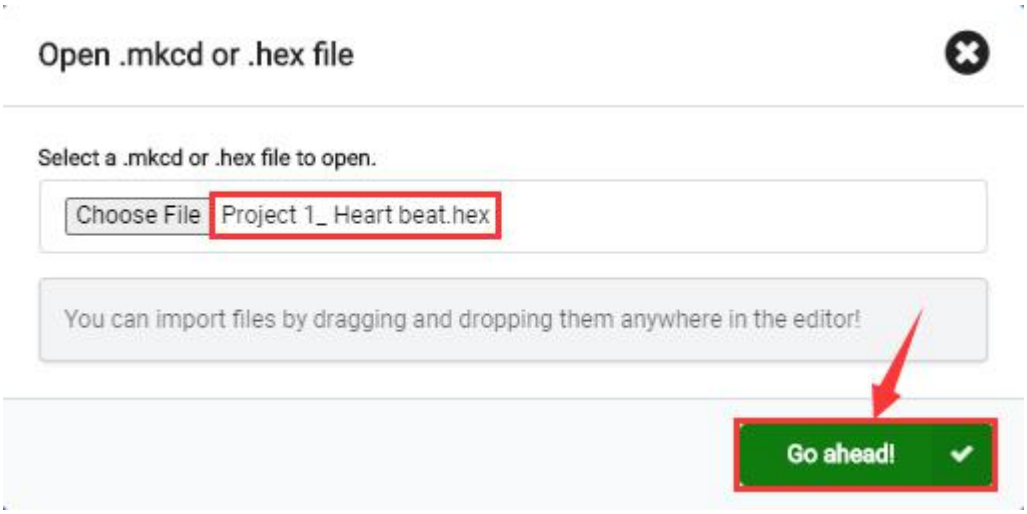
Click "Import" and "Import files".



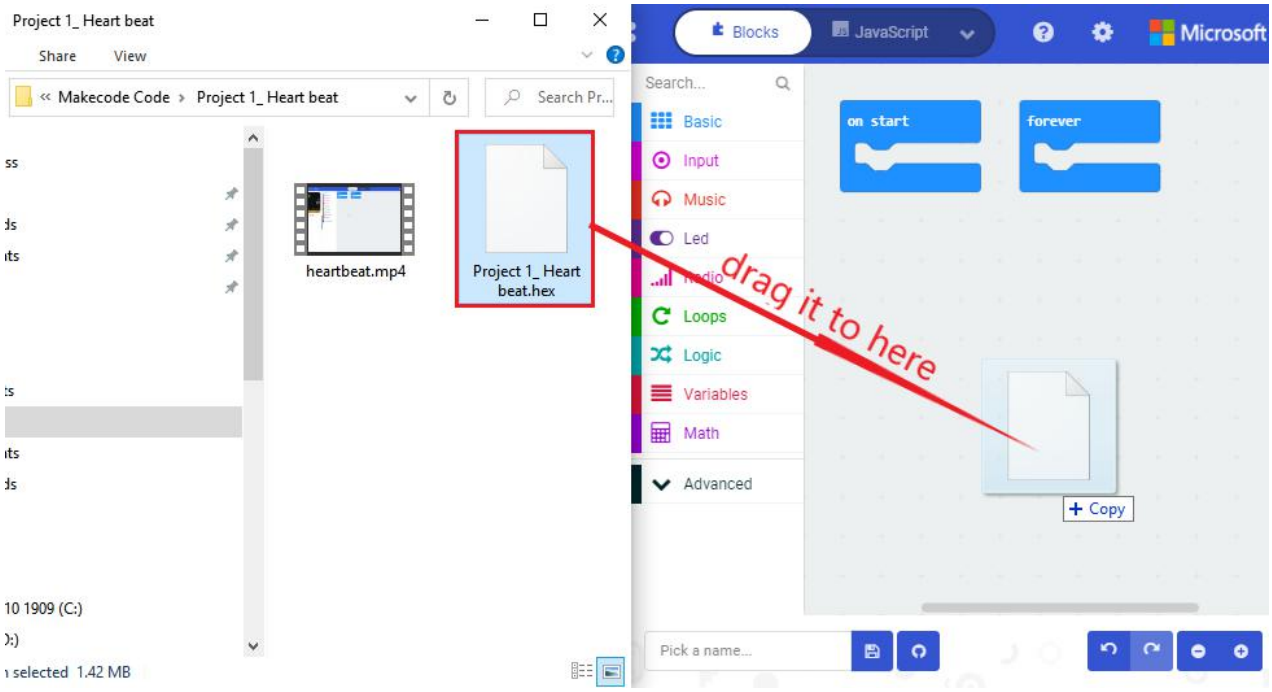


Choose file "../Makecode Code/Project 1_ Heart beat/Project 1_ Heart beat.hex", then tap "Go ahead"

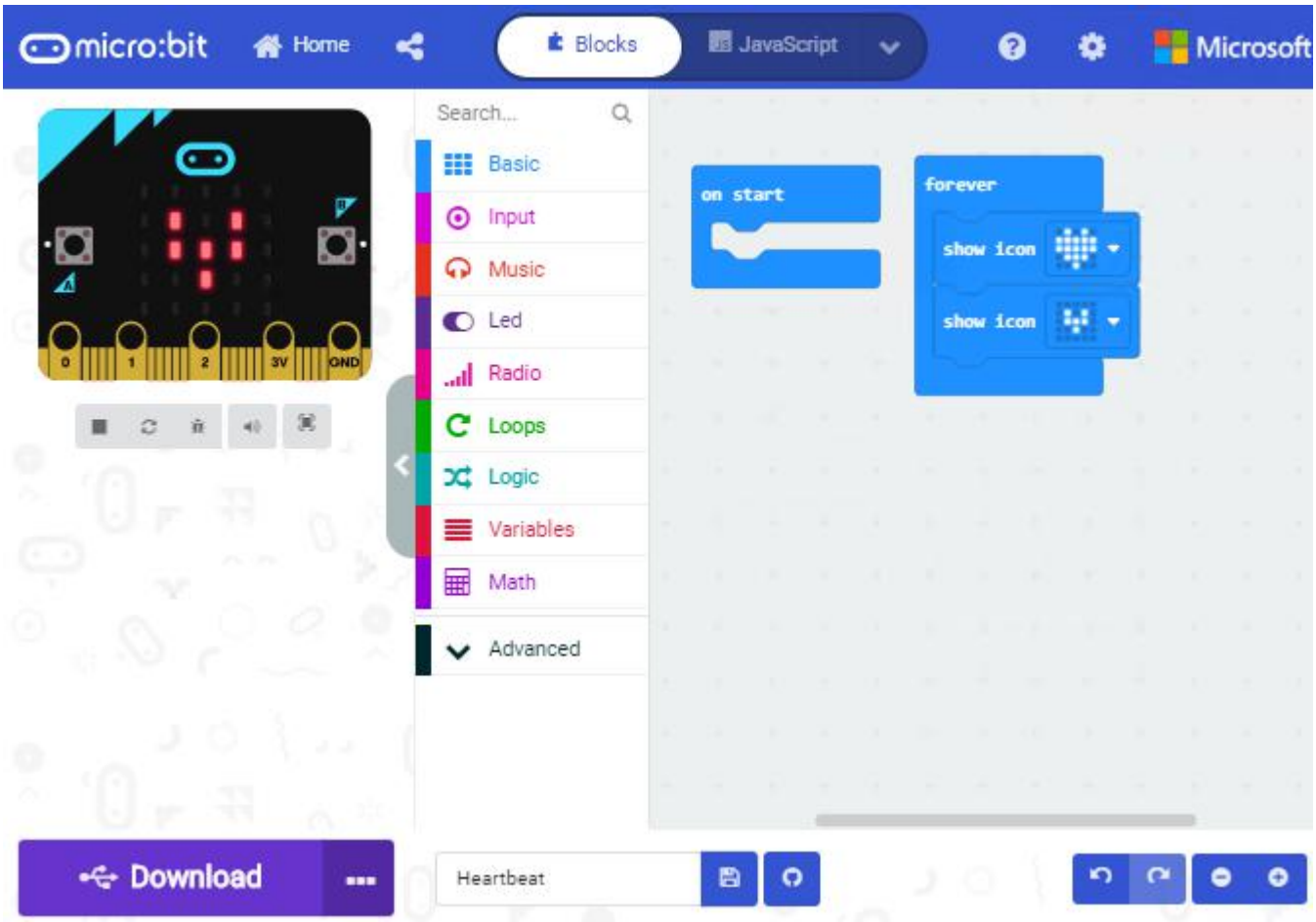

Open
« Makecode Code › Project 1_ Heart beat
Search Project 1_ Heart beat
Organize
New folder
Documents
Pictures
This PC
WPS网盘
3D Objects
Desktop
heartbeat.mp4
Project 1_ Heart beat.hex
1
2
File name:
All File
Open
Cancel
Open .mkcd or .hex file
Select a .mkcd or .hex file to open.
Choose File
No file chosen
You can import files by dragging and dropping them anywhere in the editor!
Go ahead!
My Project
Import


Open .mkcd or .hex file
Select a .mkcd or .hex file to open.
Choose File
Project 1_ Heart beat.hex
You can import files by dragging and dropping them anywhere in the editor!
Go ahead!

In addition to the above method of importing code , you can also directly drag code into the Makecode compiler, as shown in the figure below:



The program is imported successfully after a few seconds



If your computer system is Windows7/8 instead of Windows 10, the device can’ t be paired in Google Chrome, as a result, the digital and analog signals can’ t be read.

Here, we need CoolTerm software to read data.

For the whole projects, we will use CoolTerm software.

Let’ s install it firstly.

4.7. Install CoolTerm:

CoolTerm program is used to read the serial communication.

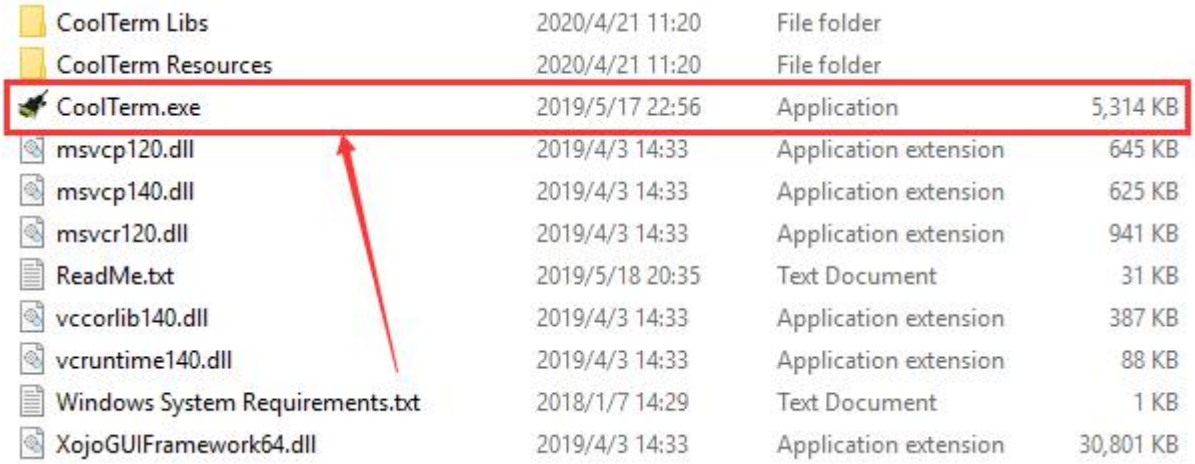
Download CoolTerm program:

https://freeware.the-meiers.org/

(1) After the download, we need to install CoolTerm win , and we take example of the Window system

(2) Choose "win"

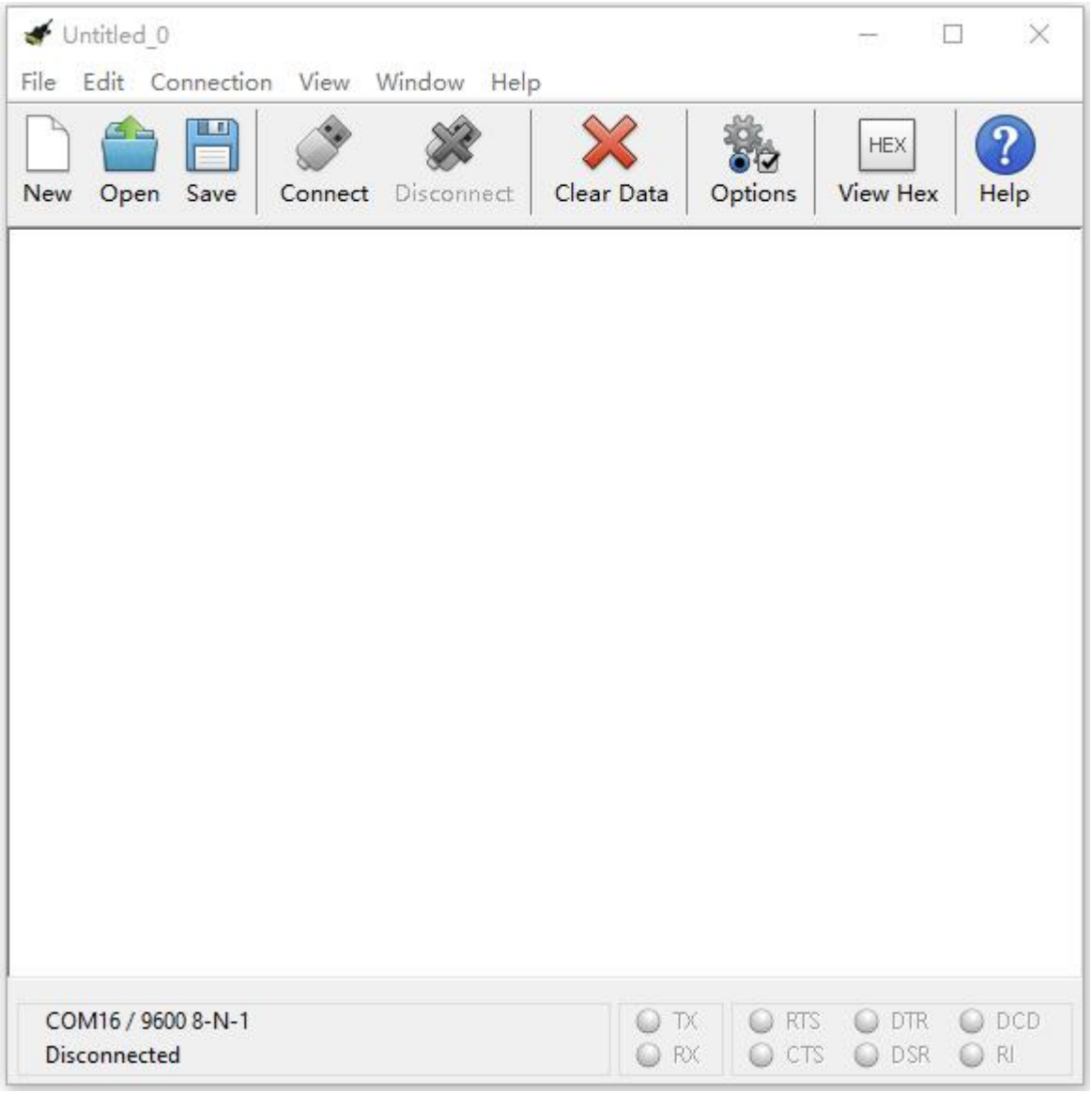
(3) Unzip file and open it. (also suitable for Mac and Linux system)



(4) Double-click 

Note: Firstly, you have to install the driver of micro:bit and connect

micro:bit V2 to computer.



The functions of each button on the toolbar are listed below:

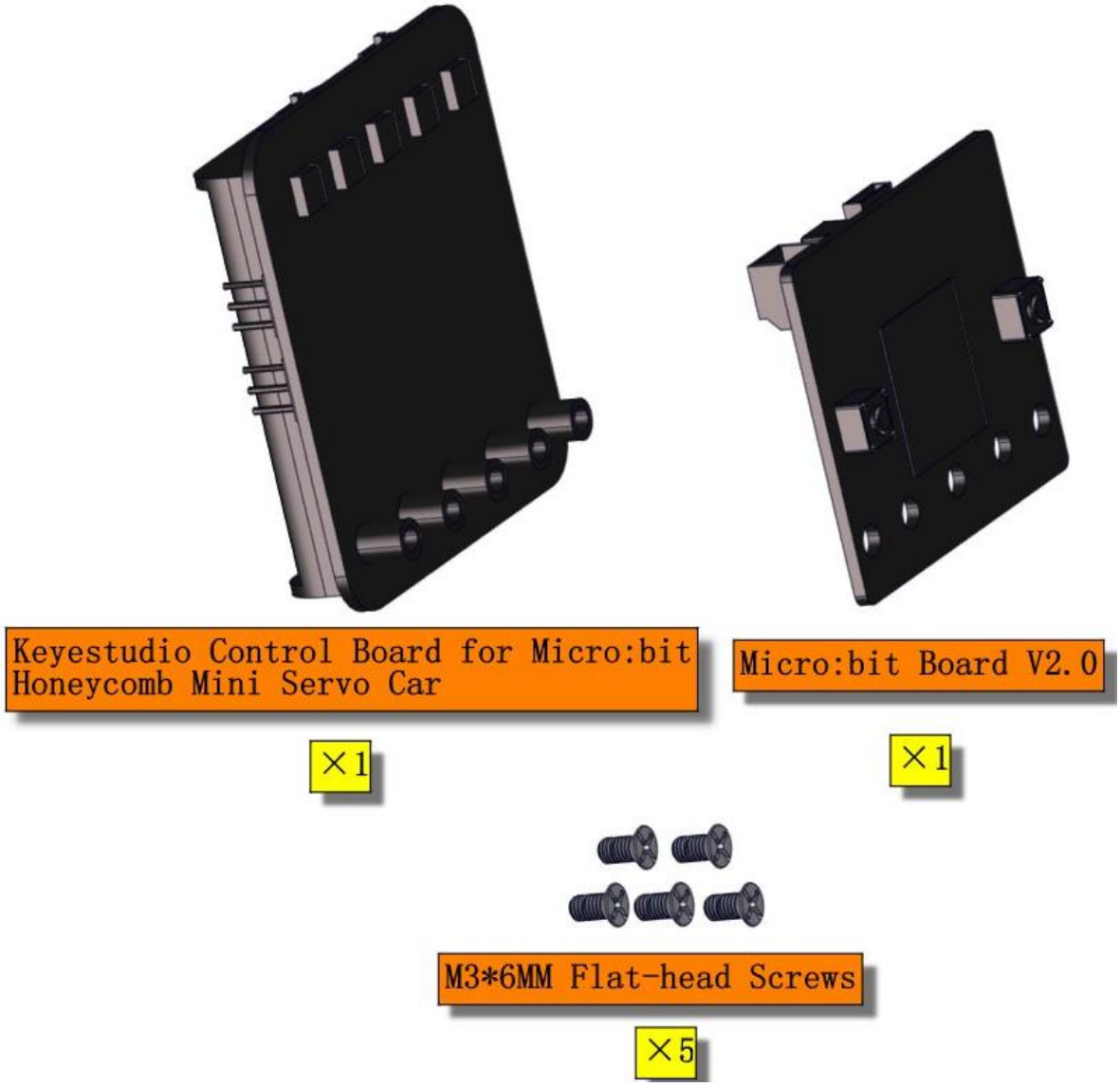
New	Opens up a new Terminal
Open	Opens a saved Connection
Save	Saves the current Connection to disk
Connect	Opens the Serial Connection
Disconnect	Closes the Serial Connection
Clear Data	Clears the Received Data
Options	Opens the Connection Options Dialog
HEX View Hex	Displays the Terminal Data in Hexadecimal Format
Help	Displays the Help Window

5. Install Micro:bit Desk Bit Car:

5.1 Install micro:bit V2 and control board

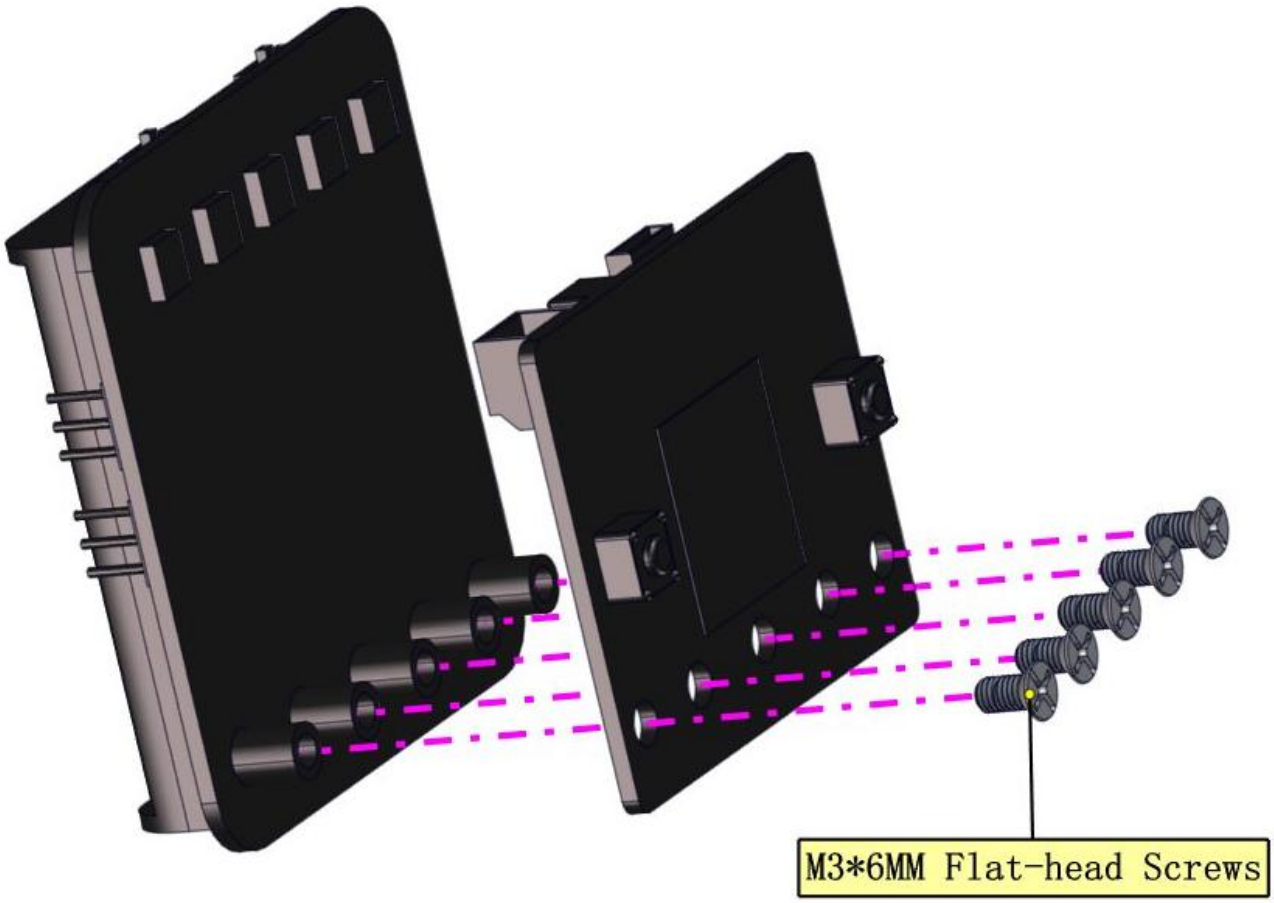
a. Preparations:

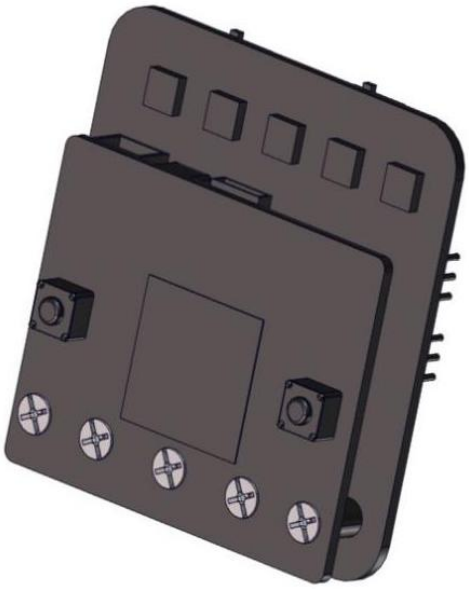
Note: take out the 5 pcs M3*6MM flat screws from control board



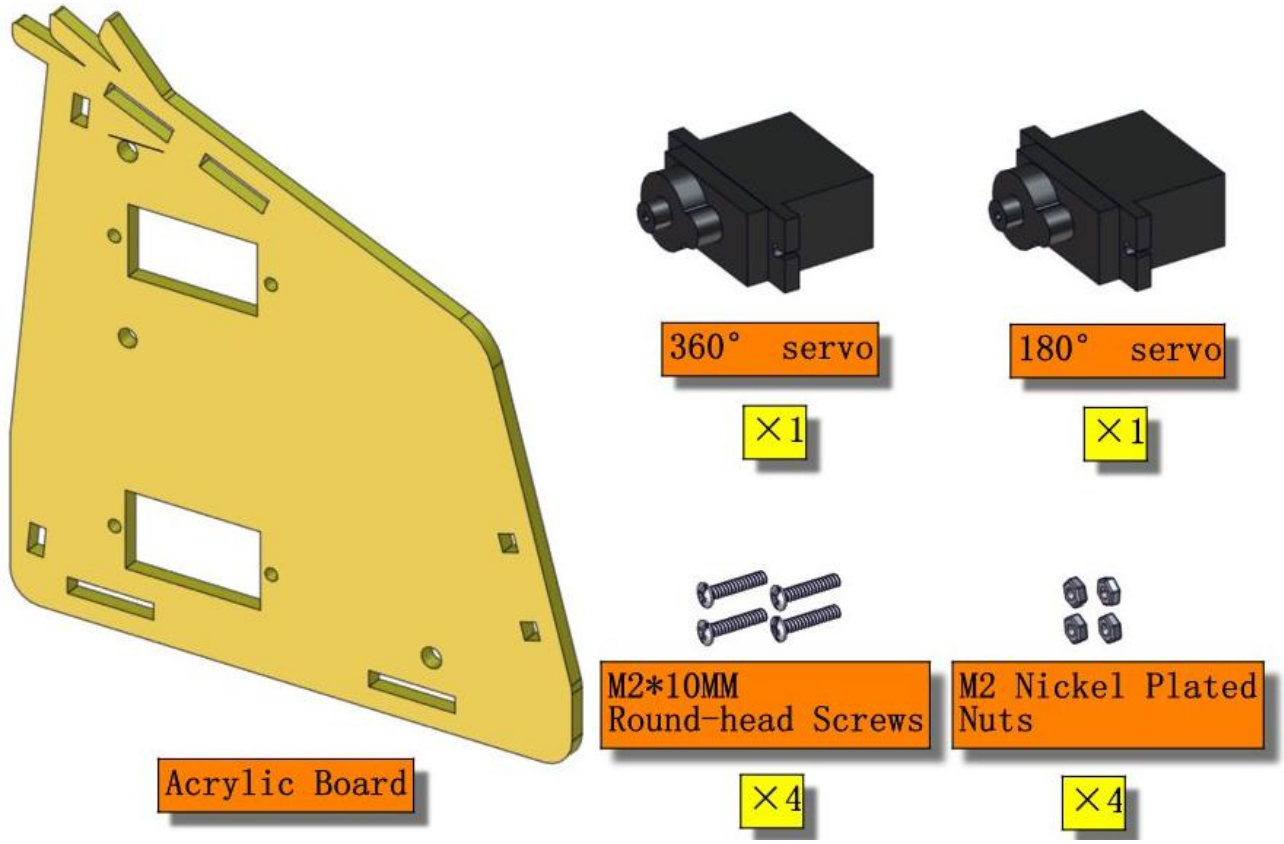
b. Then fix micro:bit onto control board with 5 pcs M3*6MM flat screws, as

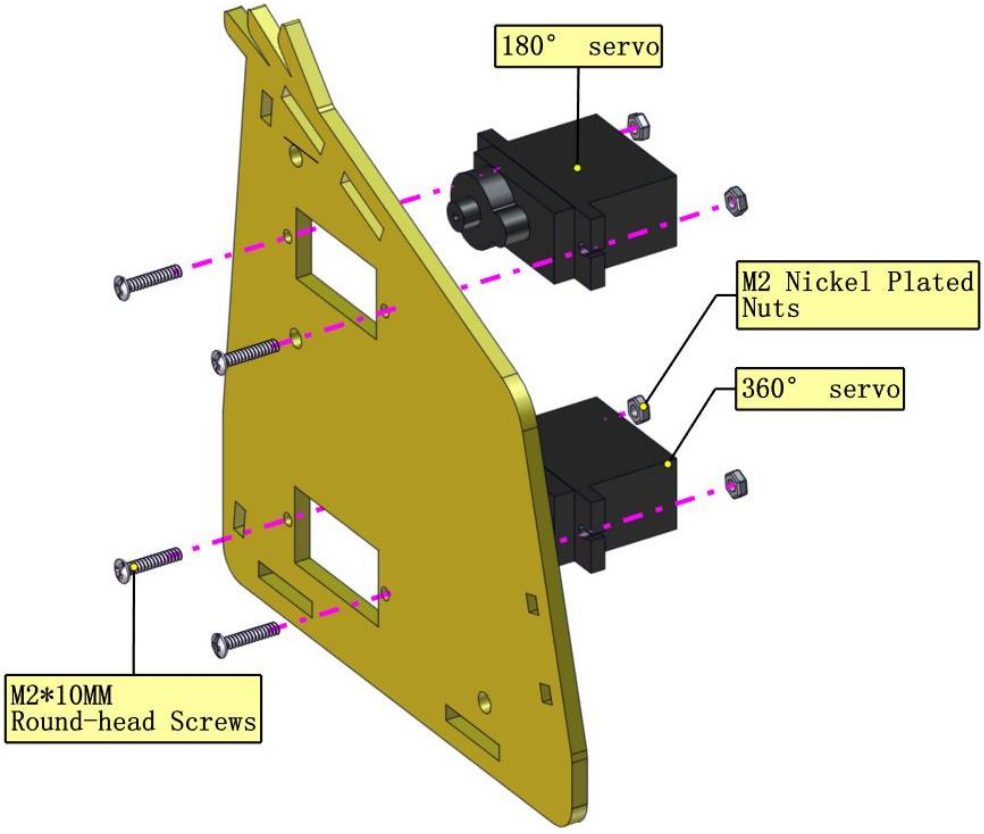
shown below;

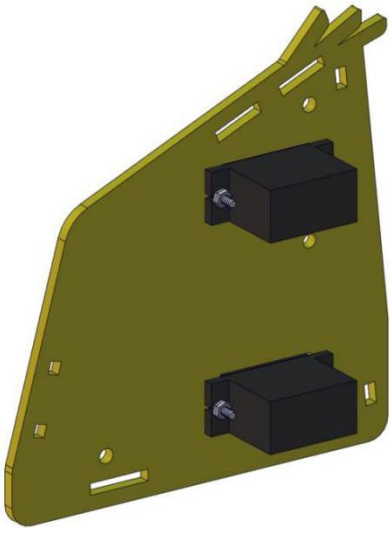




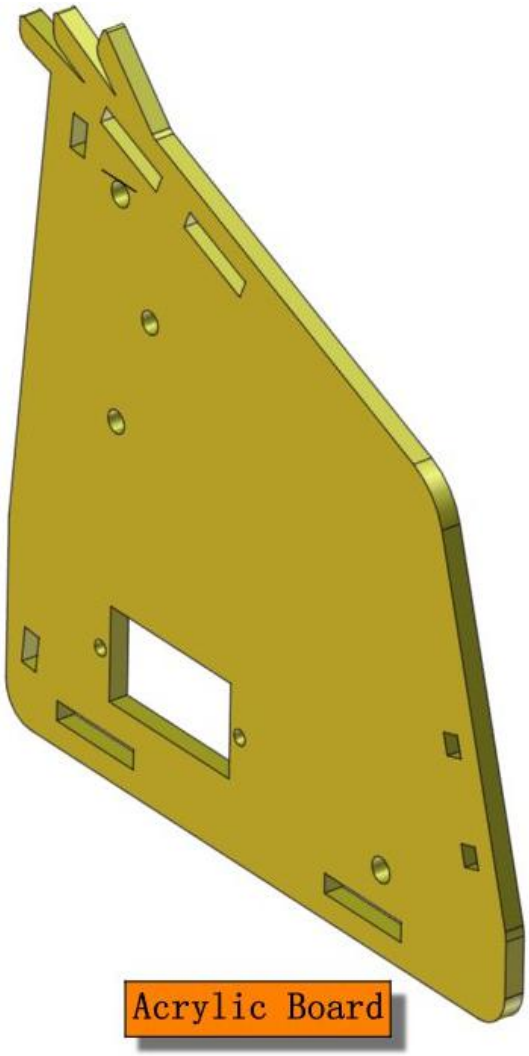
2. Mount the right board

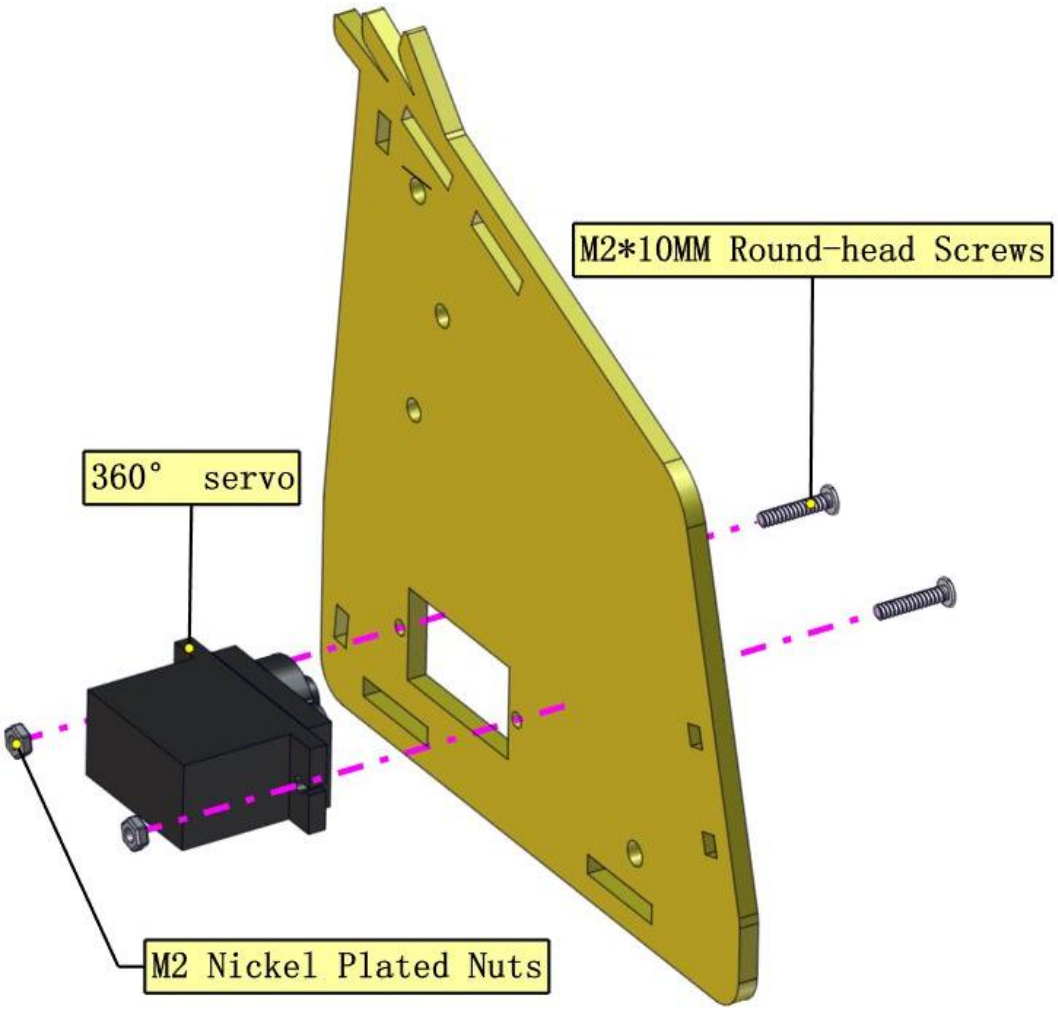


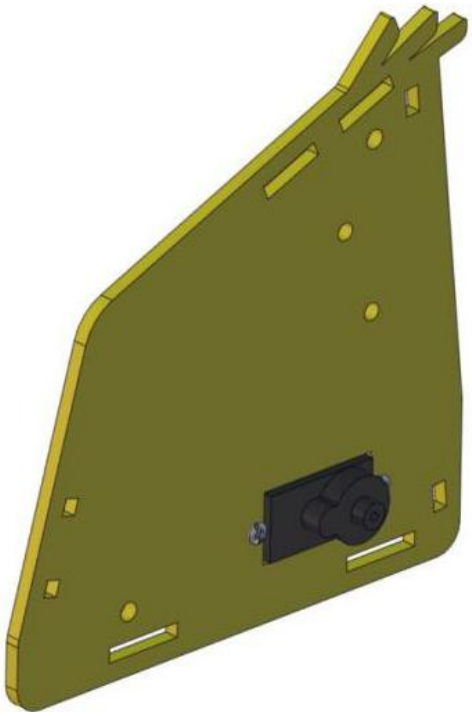




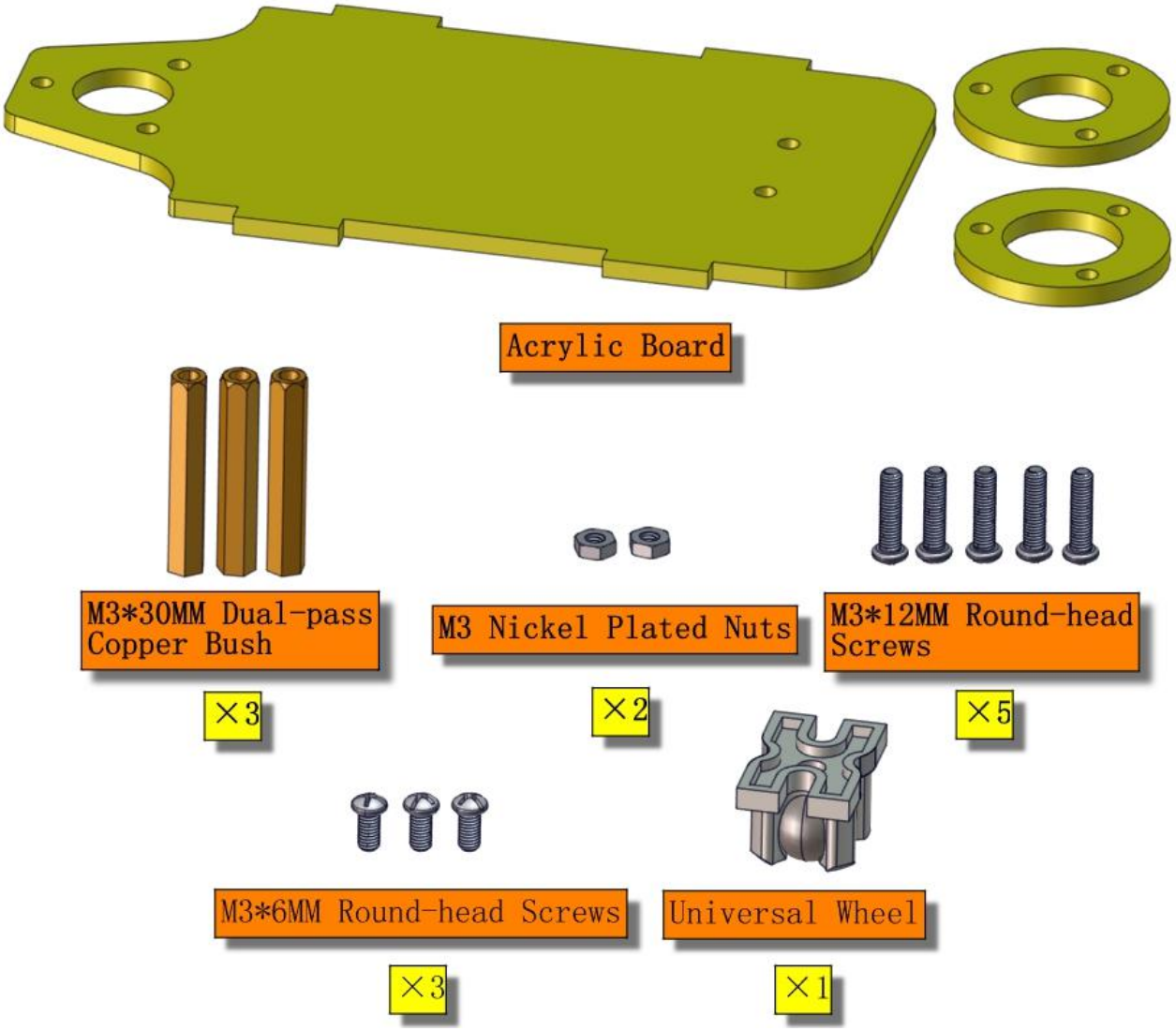
3. Assemble left board

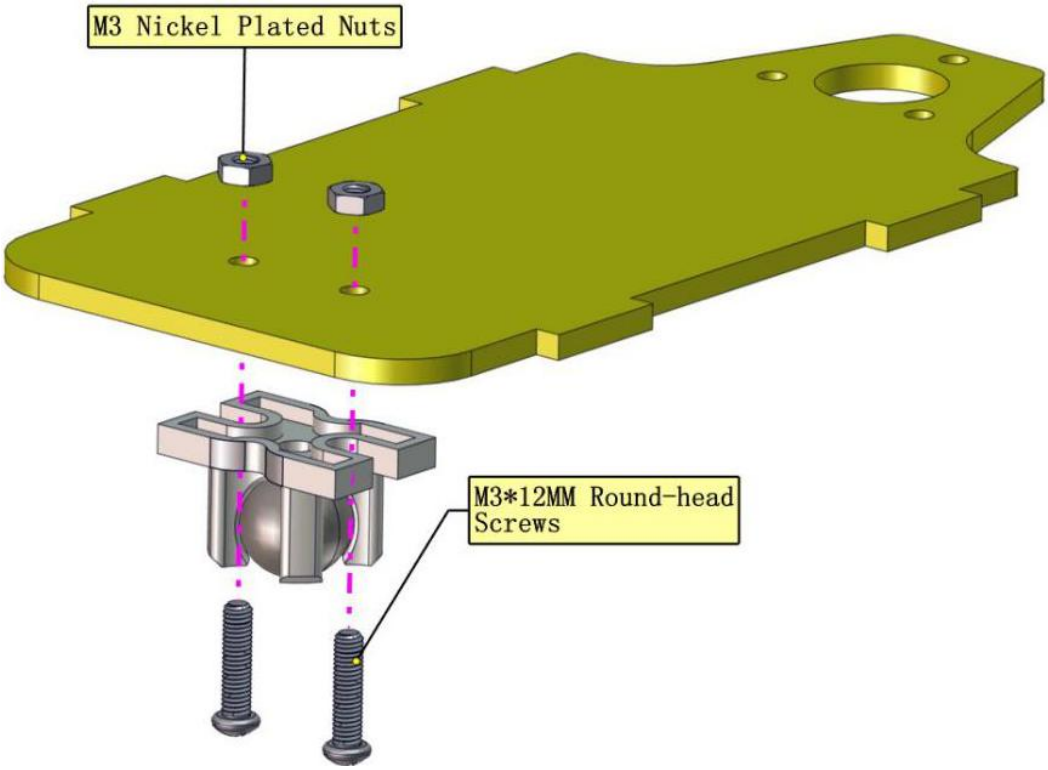


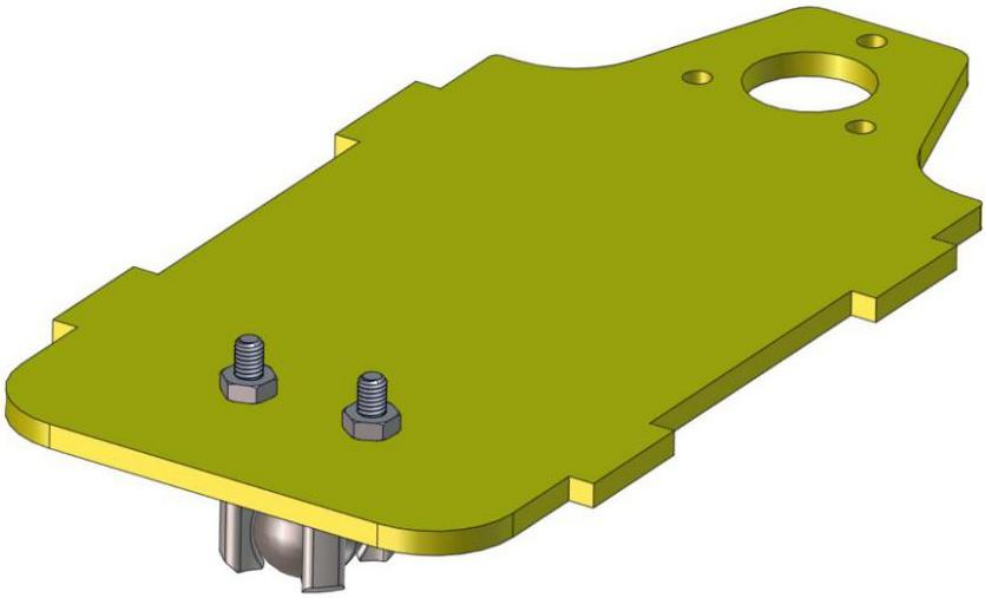

M2*10MM Round-head Screws
360° servo
M2 Nickel Plated Nuts

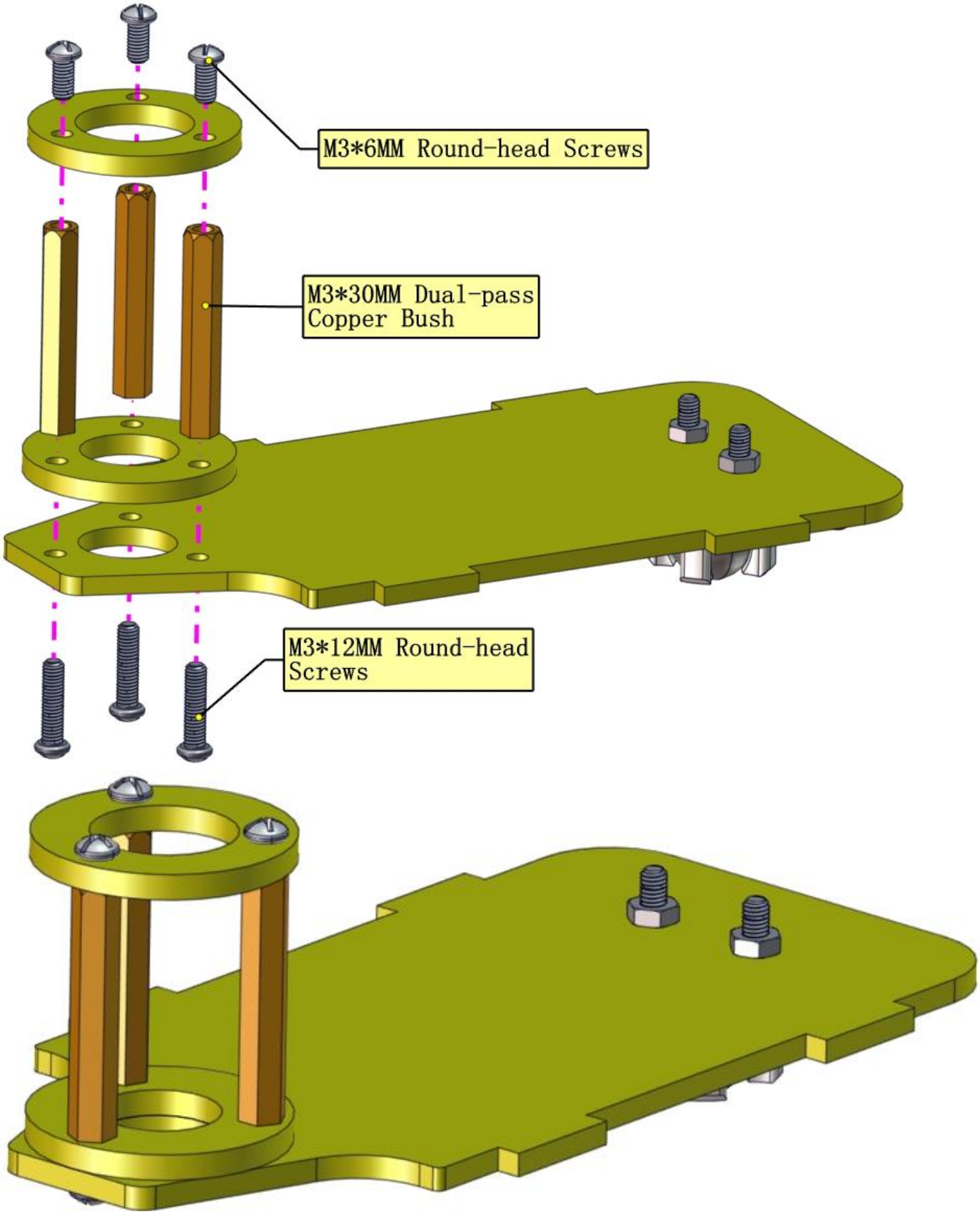


4. Mount Base Plate

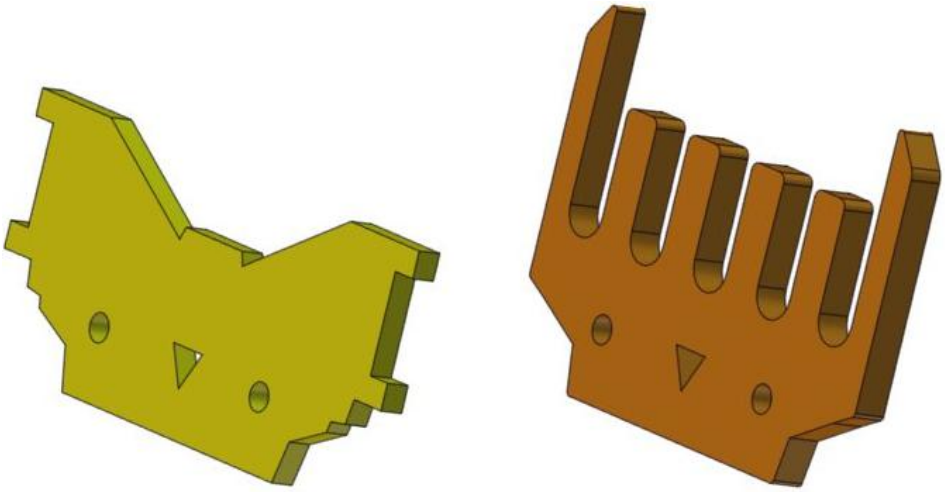



M3 Nickel Plated Nuts
M3*12MM Round-head Screws




M3*6MM Round-head Screws
M3*30MM Dual-pass Copper Bush
M3*12MM Round-head Screws

5. Install the insertion part of control board



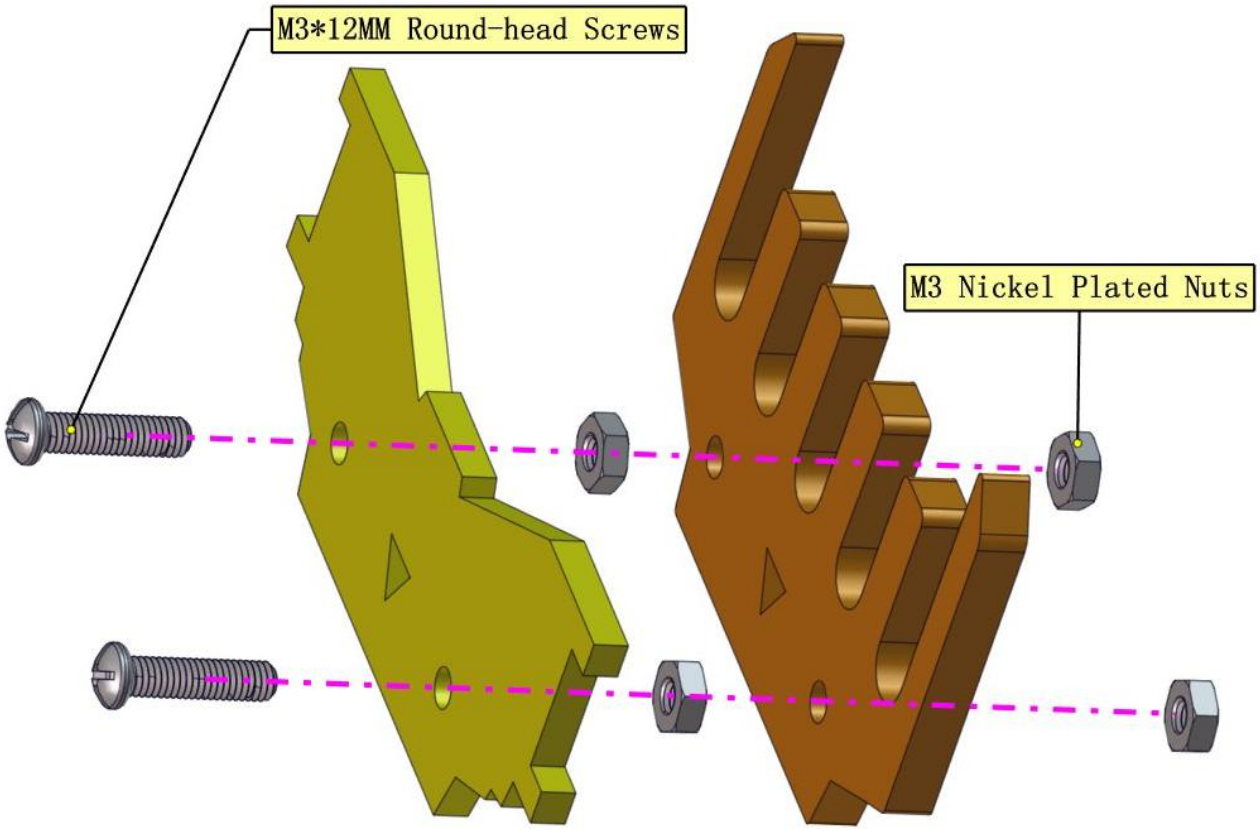
Acrylic Board

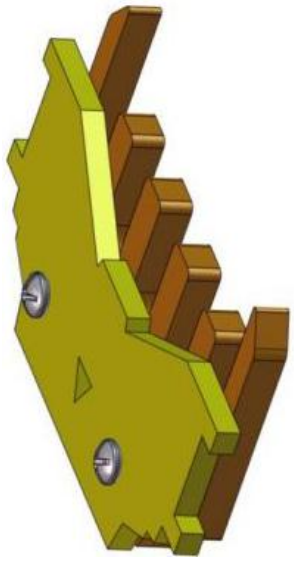
M3*12MM Round-head Screws

×2

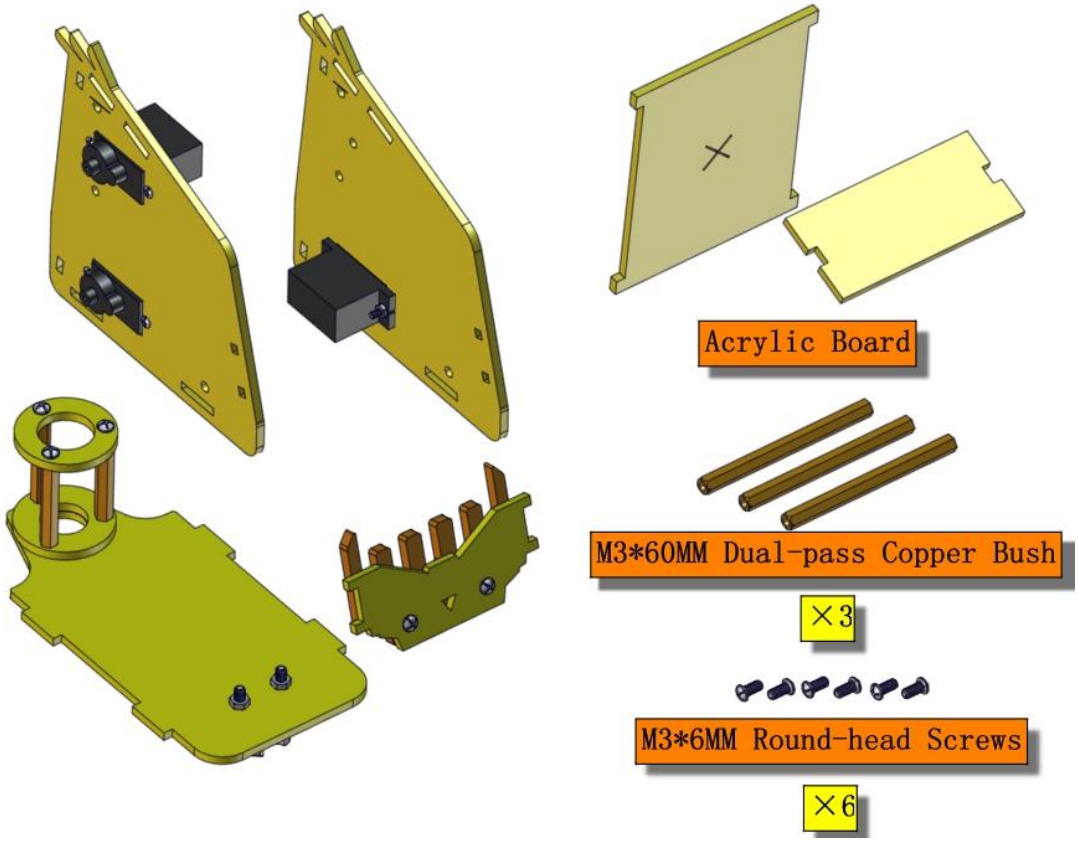
M3 Nickel Plated Nuts

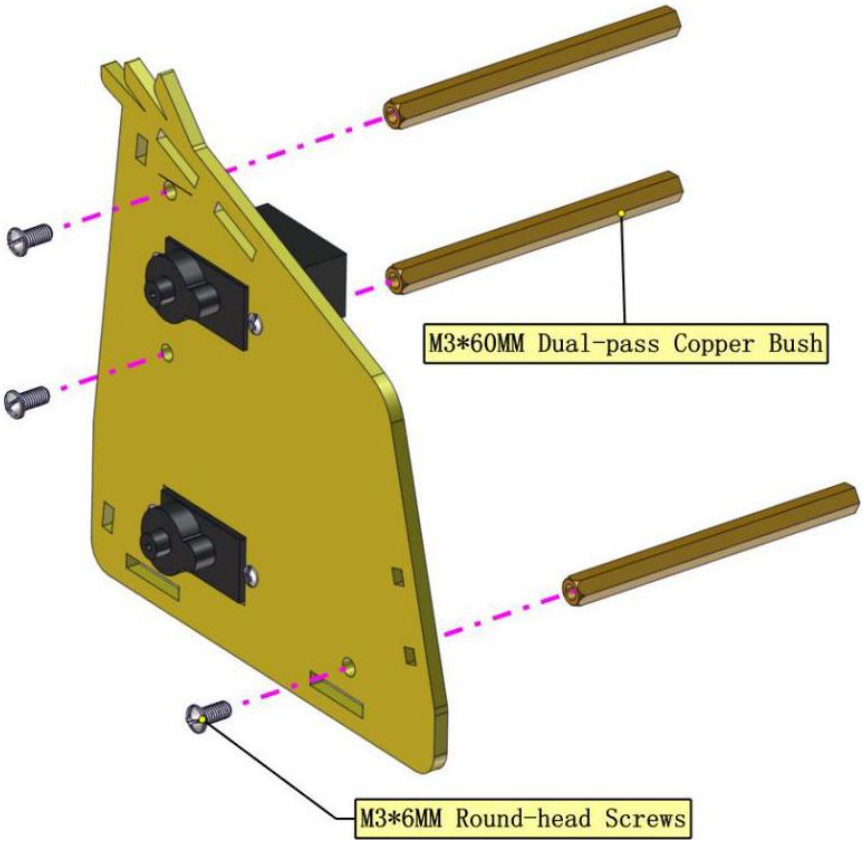
×4

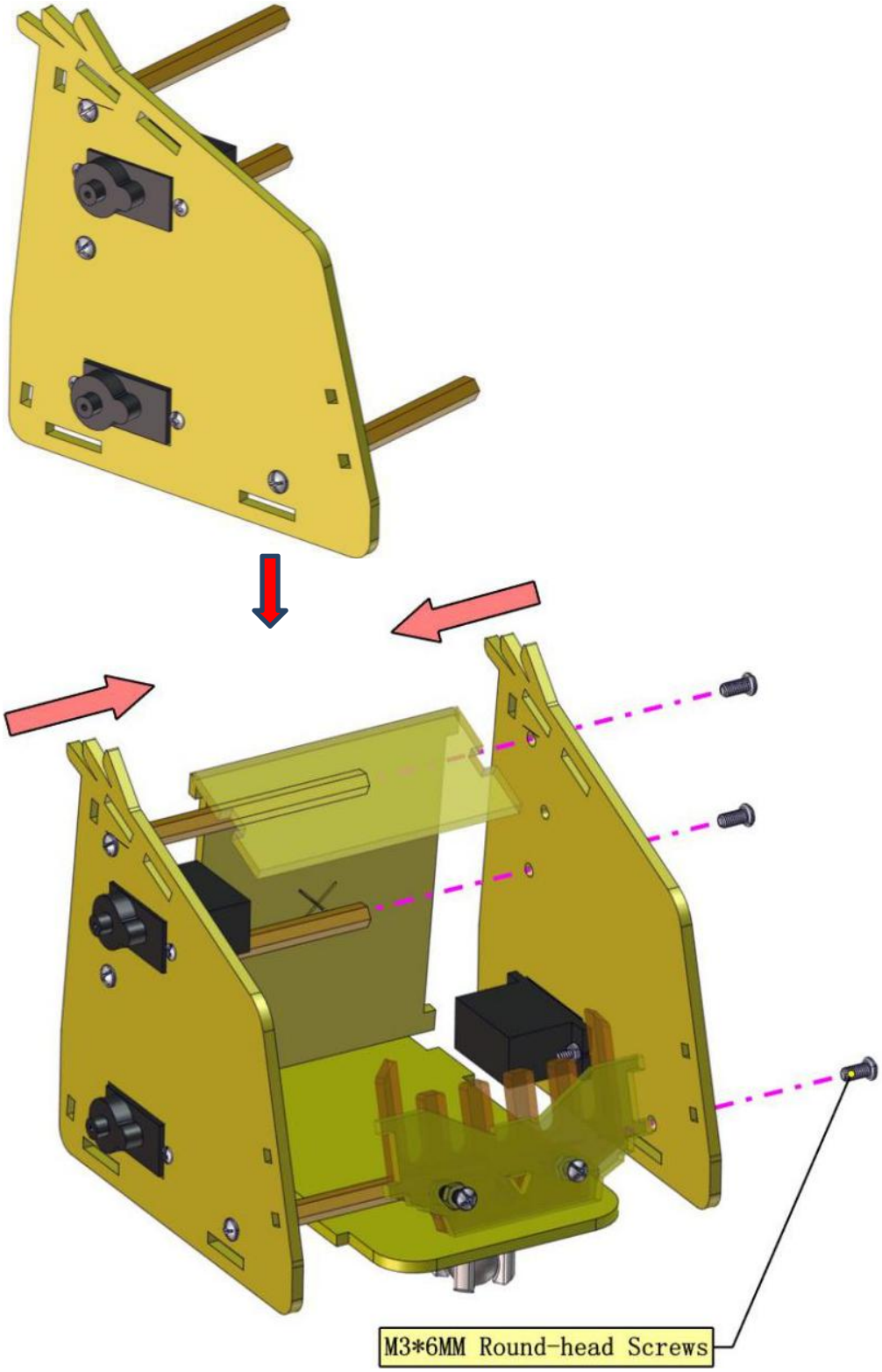


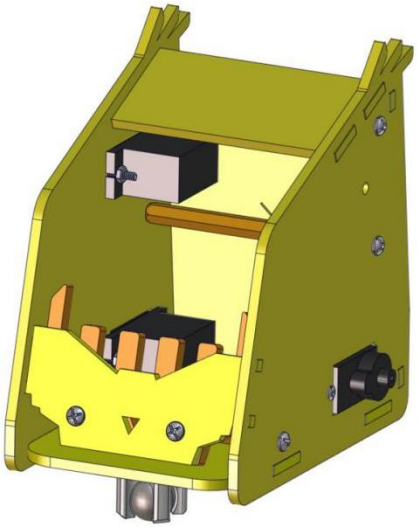


6. Fix the boards of desk bit car

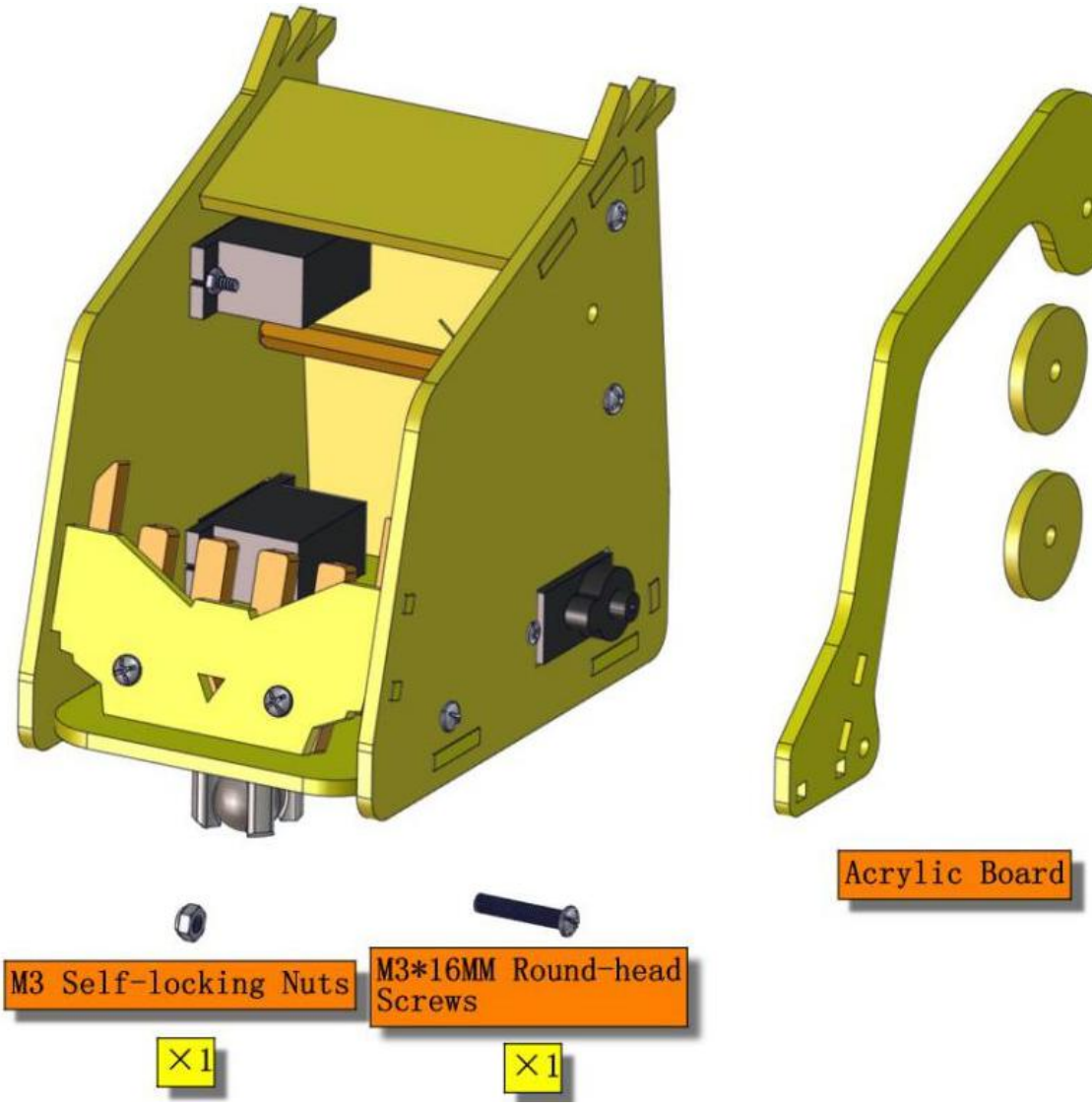

Acrylic Board
M3*60MM Dual-pass Copper Bush
×3
M3*6MM Round-head Screws
×6

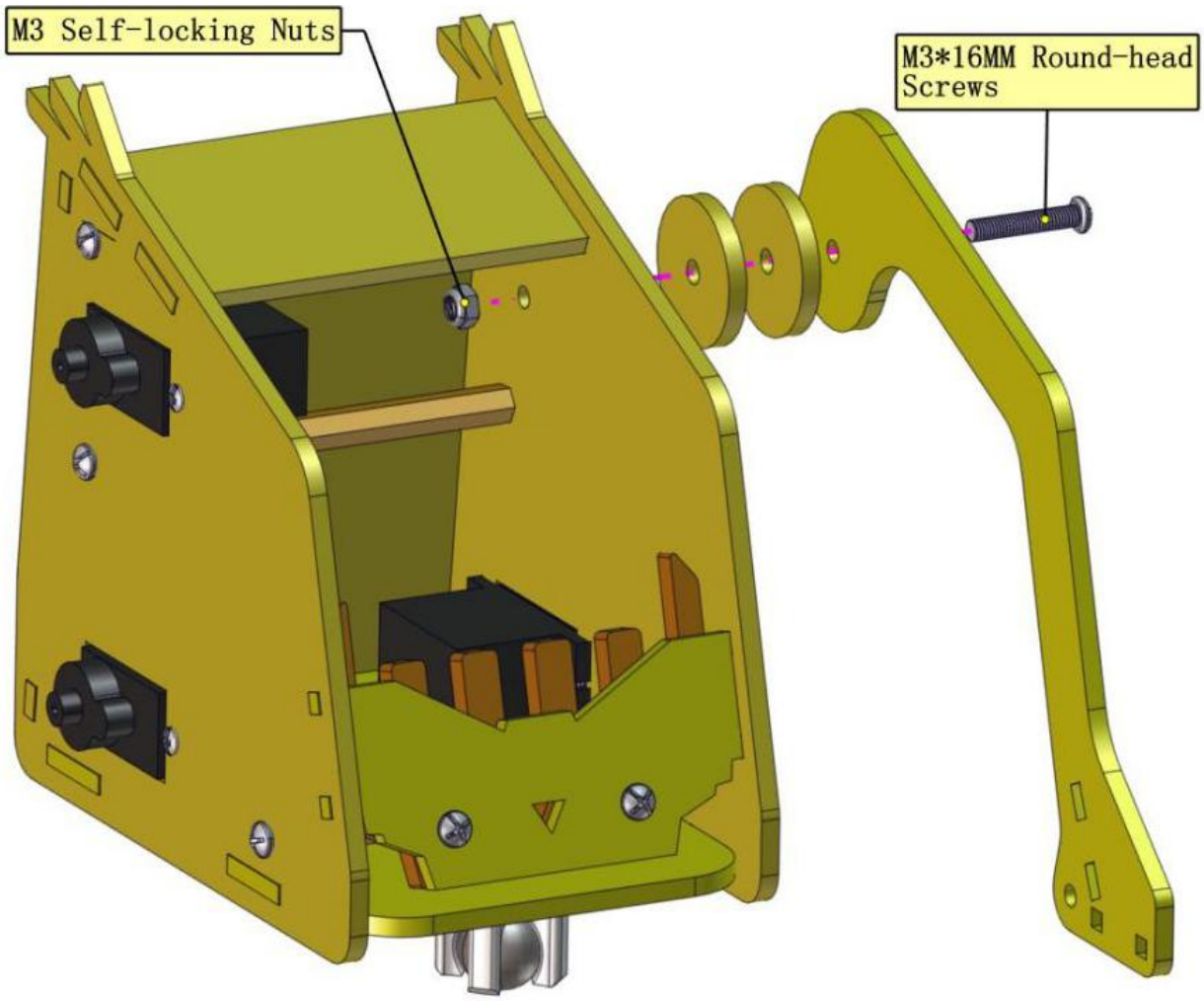

M3*60MM Dual-pass Copper Bush
M3*6MM Round-head Screws

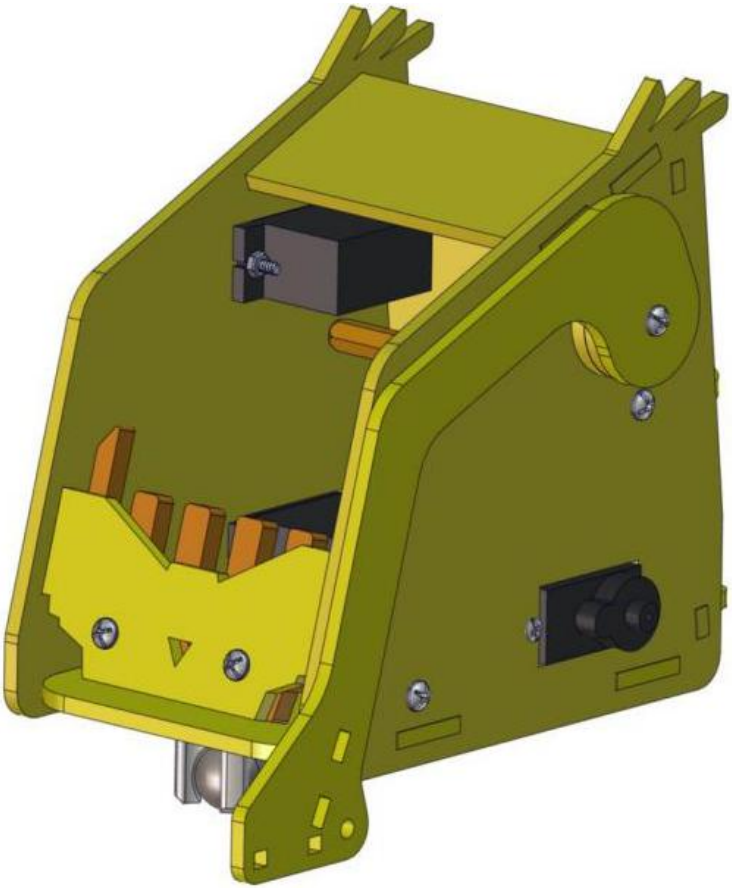

M3*6MM Round-head Screws



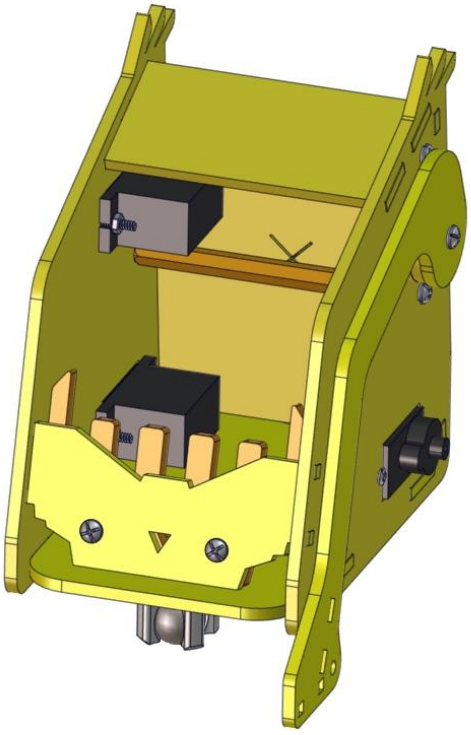
7. Fix left arm:

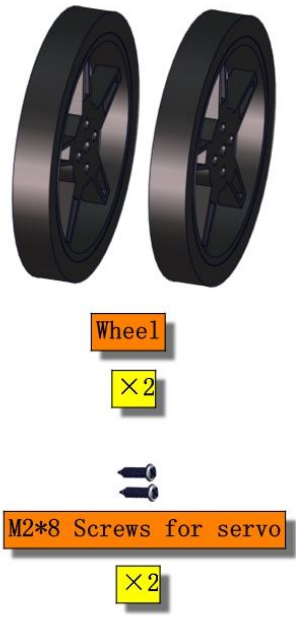


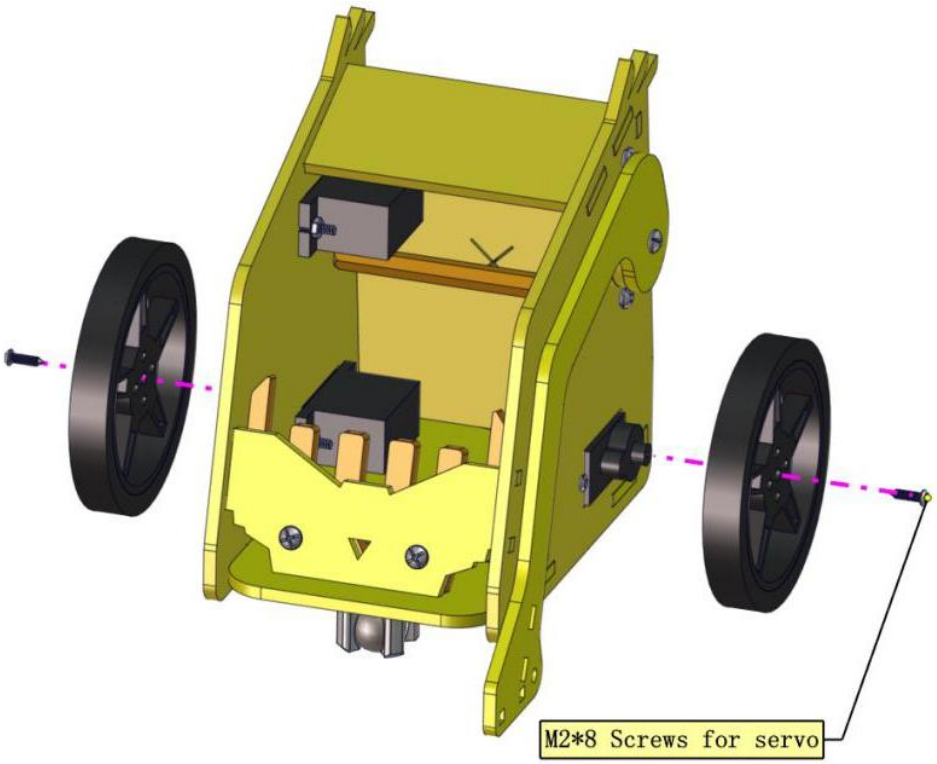

M3 Self-locking Nuts
M3*16MM Round-head Screws

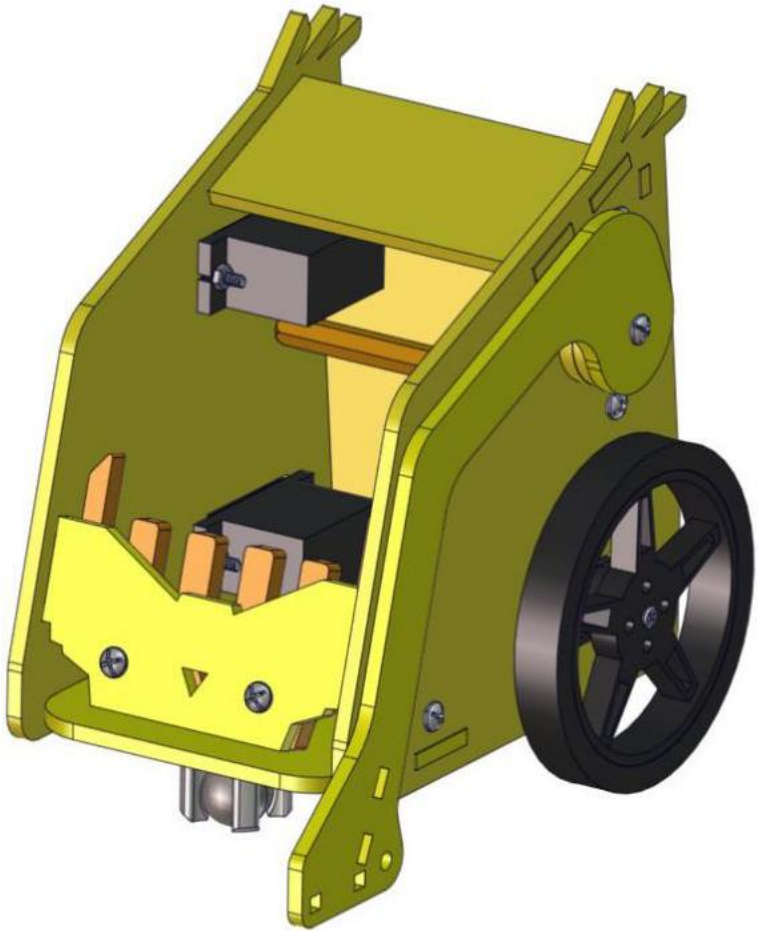


8. Mount Wheels

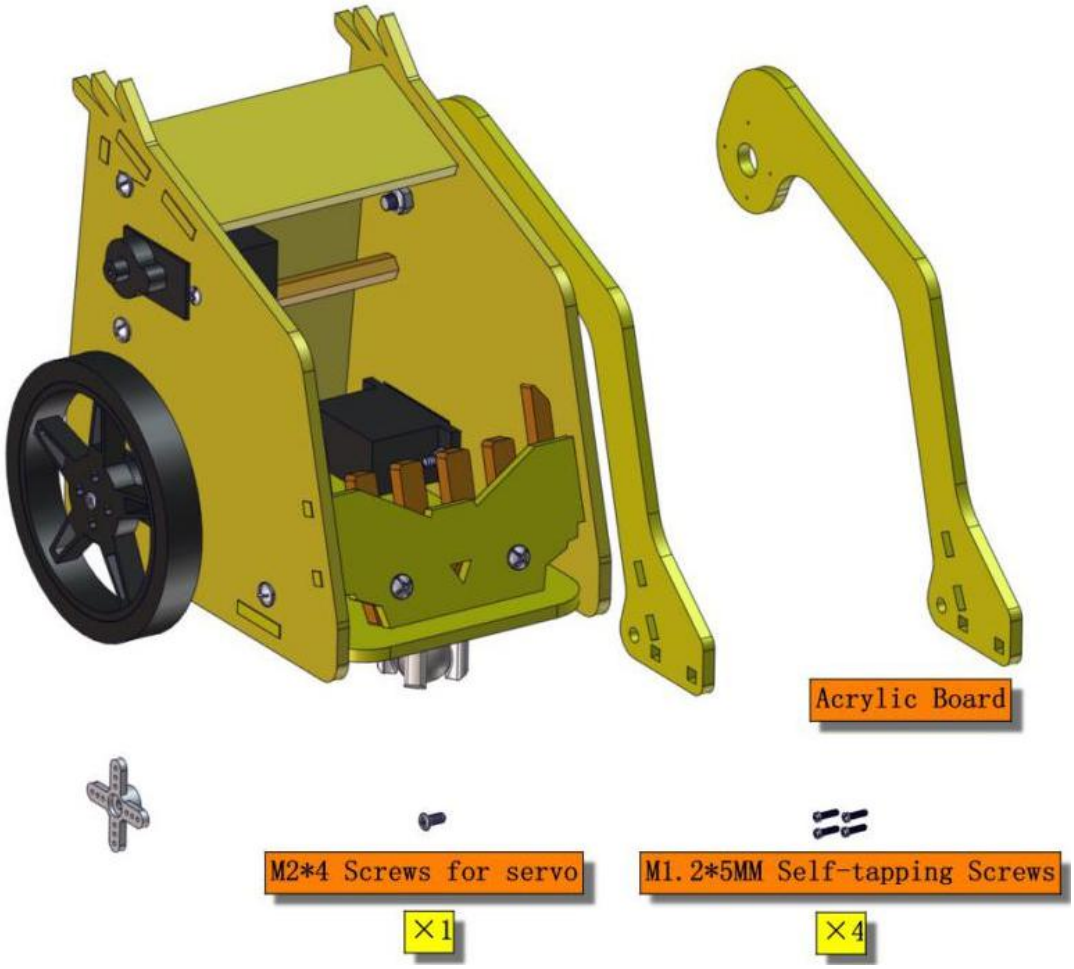




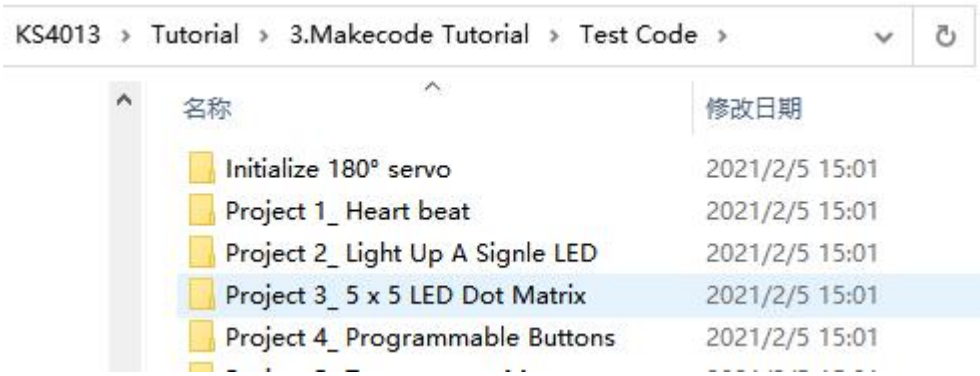

M2*8 Screws for servo



9. Mount Right Arm



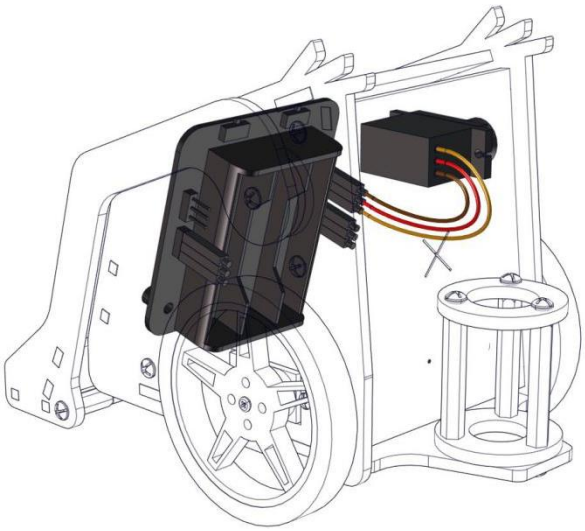
Open the shared folder in the resource link,



And find out the folder "Initialize 180° servo"

Initialize 180° servo to 0°.

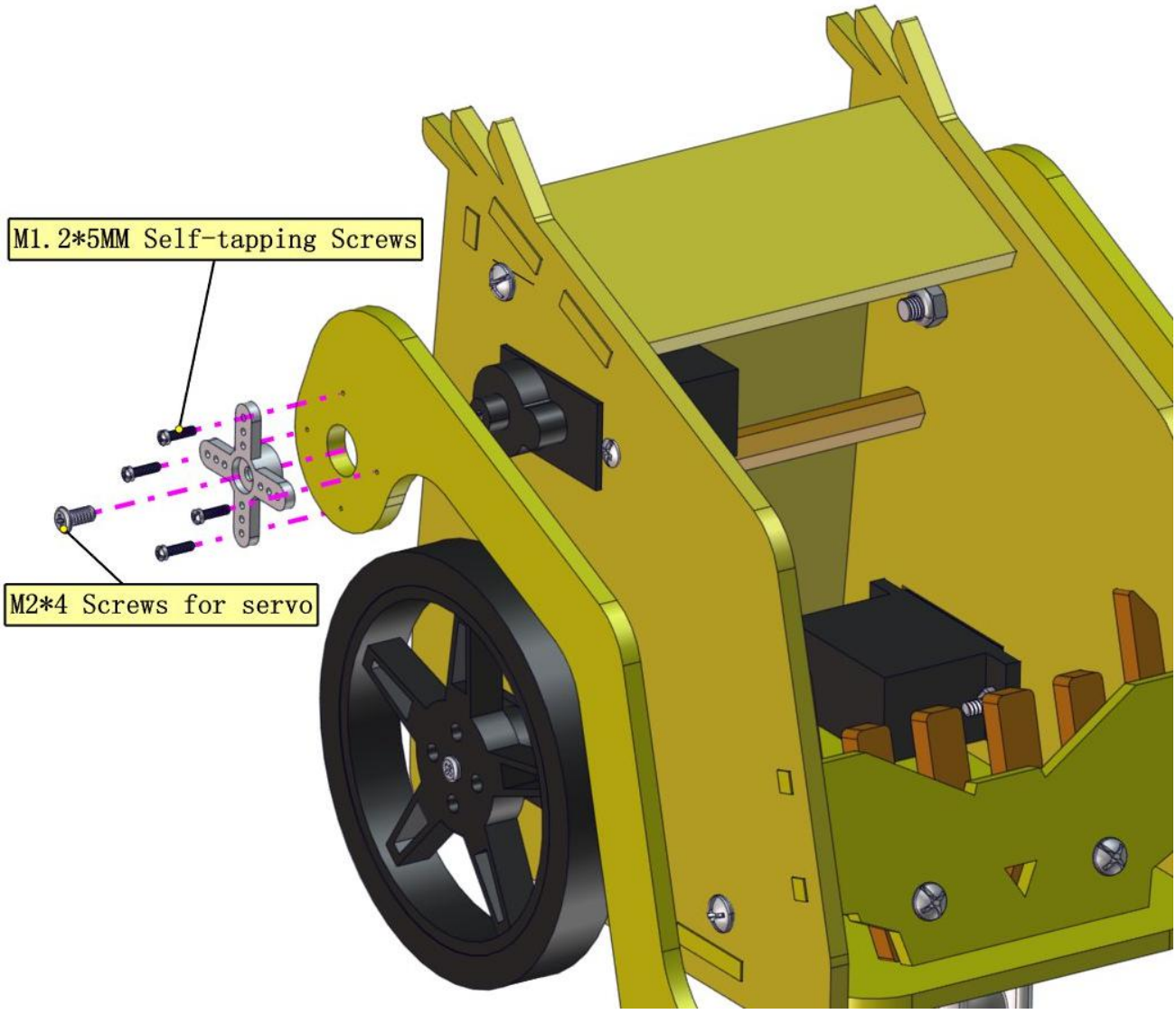
Component	180° servo
Pin of Micro:bit V2	P0
	G（Brown）, V （Red), S（Yellow） SERVO 3

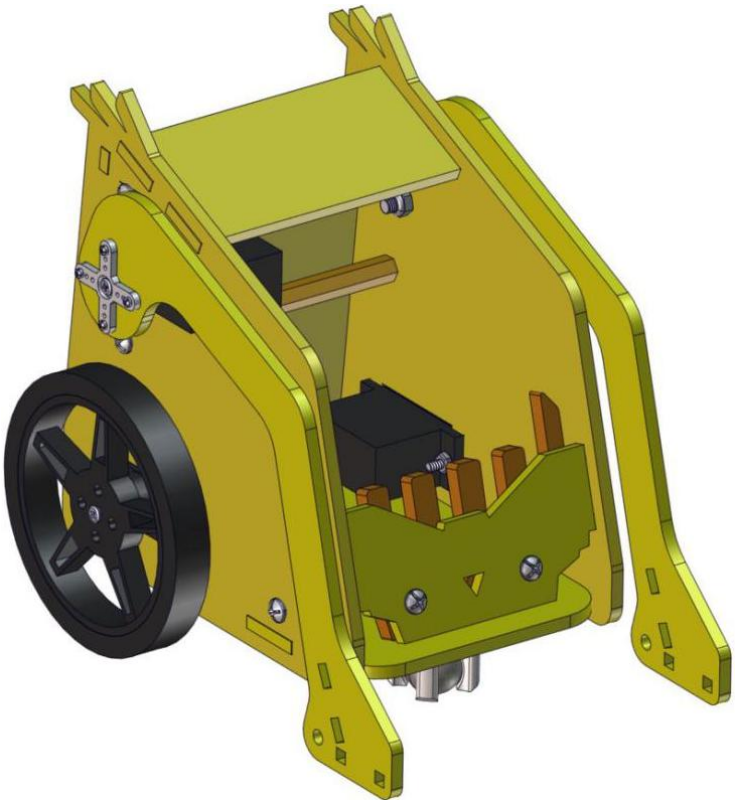


Dial the DIP switch to ON end to power on

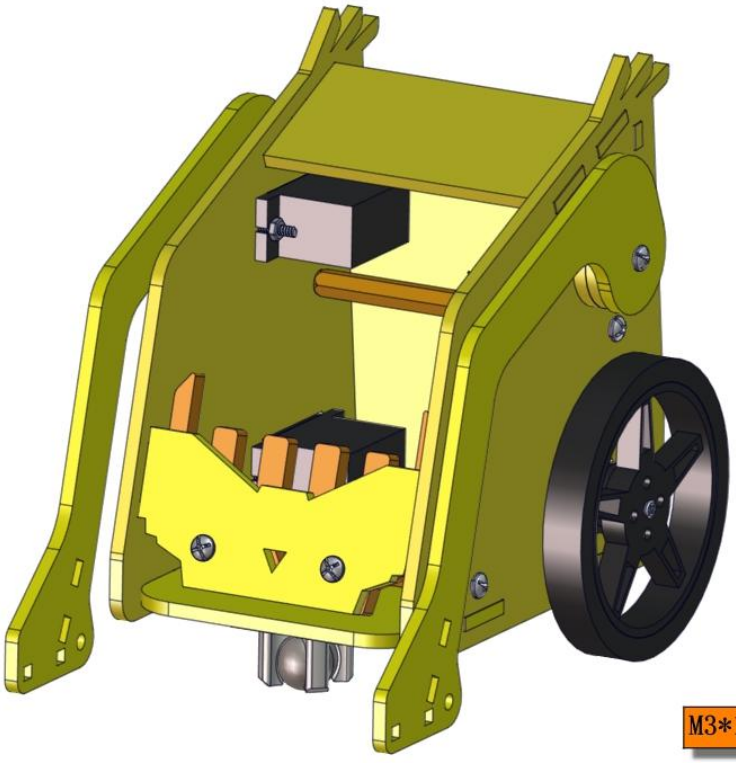
Dial the DIP switch to SERVO end to control servo

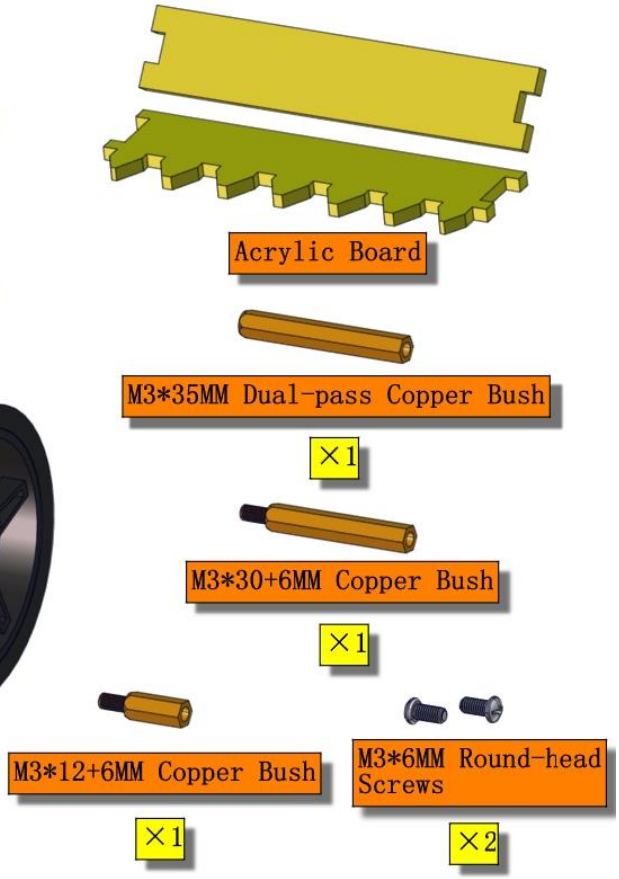
Download code to micro:bit V2 and plug in power with USB cable. Rotate servo to 0°

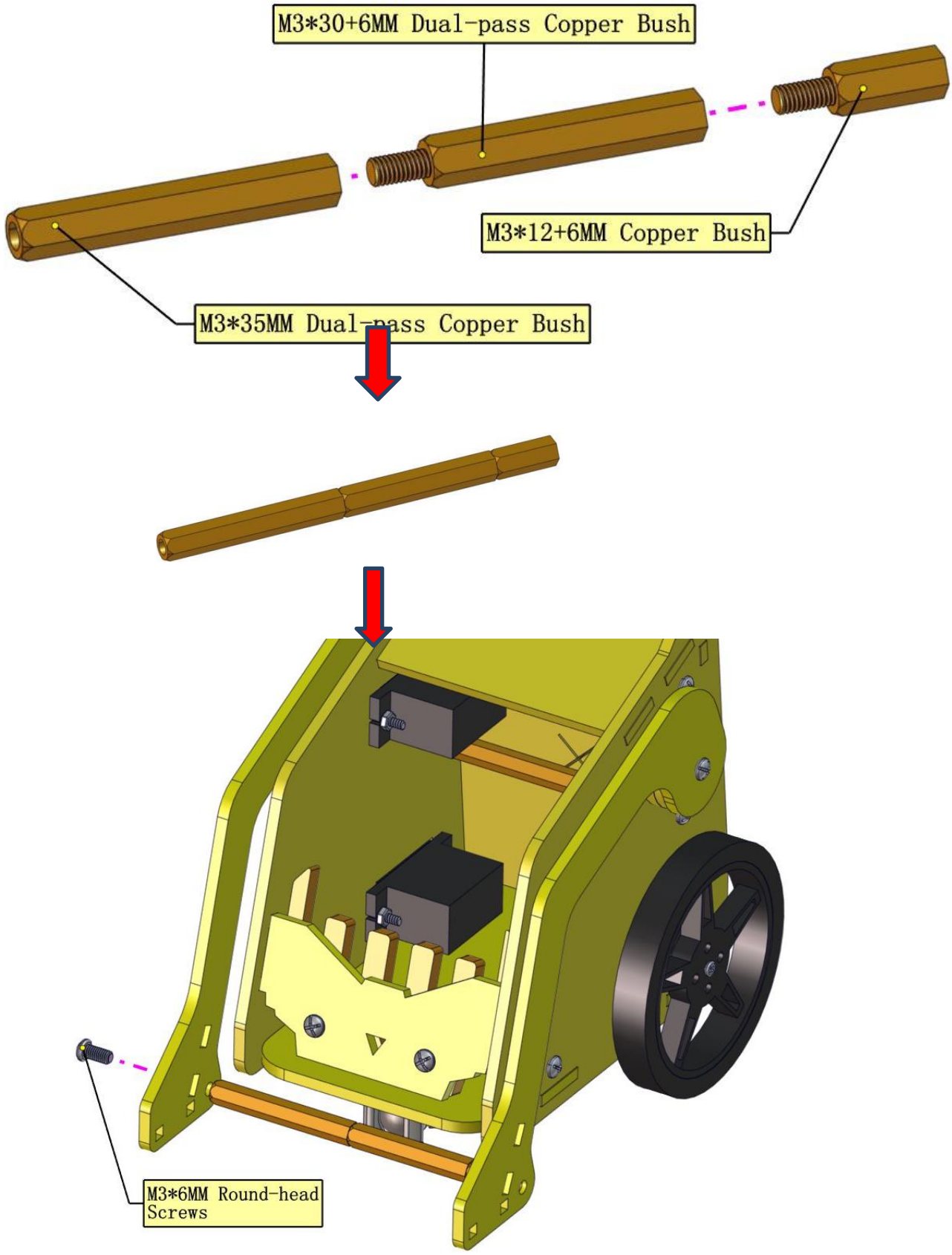


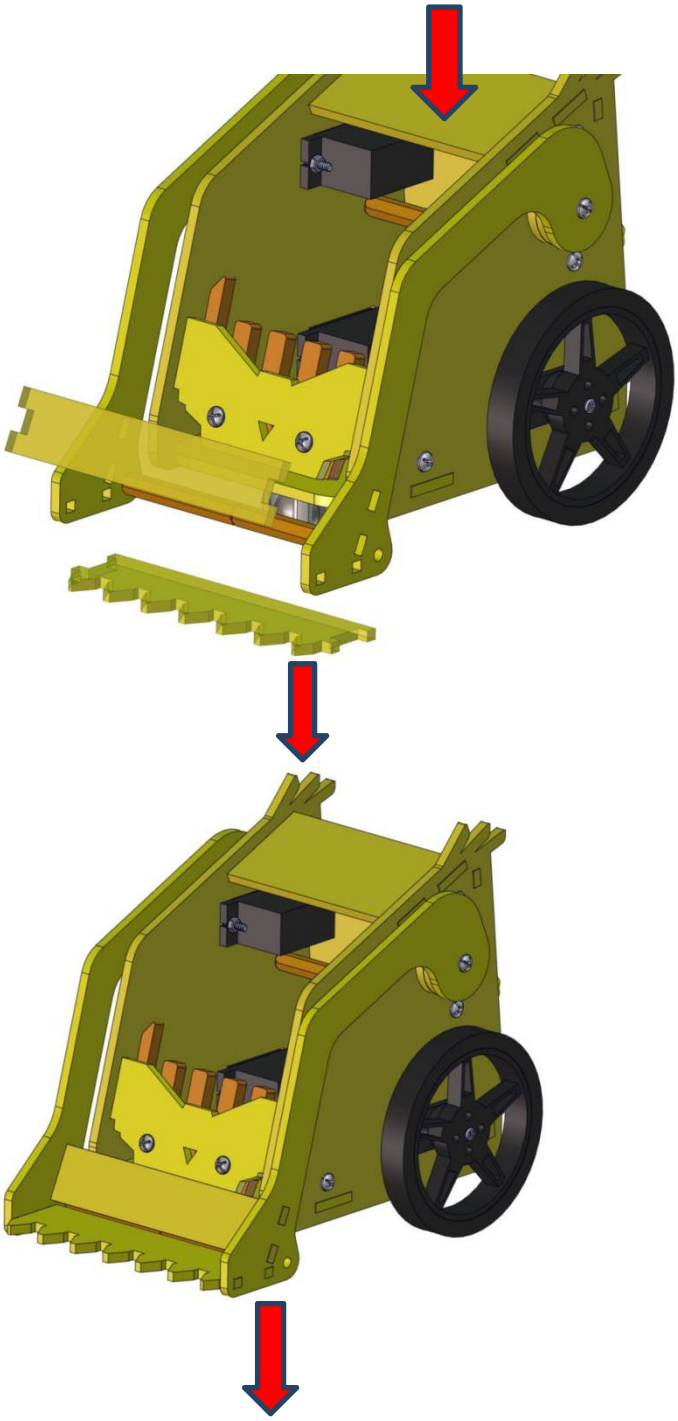


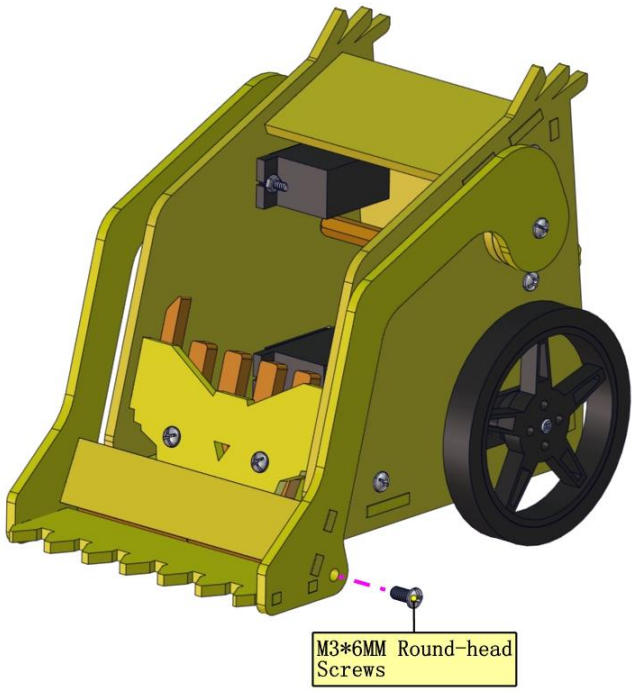
6. Install the fork part.

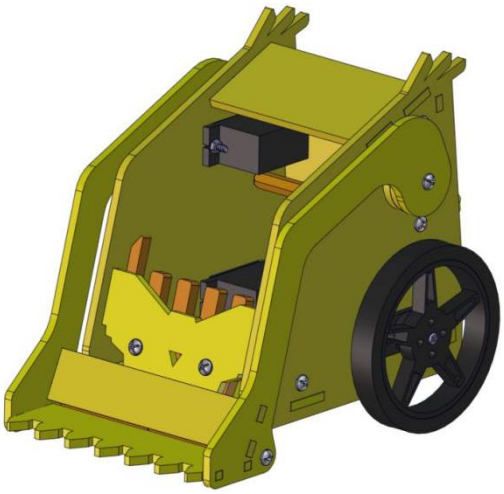





M3*30+6MM Dual-pass Copper Bush
M3*12+6MM Copper Bush
M3*35MM Dual-pass Copper Bush
M3*6MM Round-head Screws

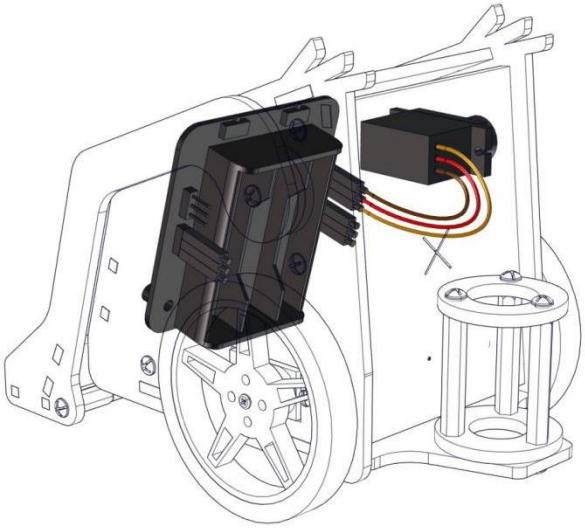




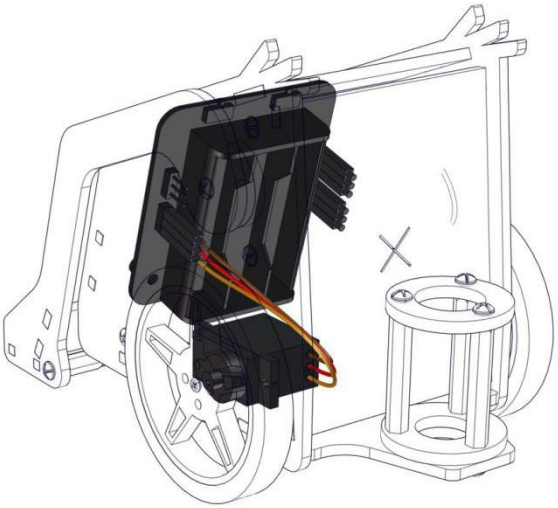


Component	Servo (180°)	Servo of right wheel (360°)	Servo of left wheel (360°)
Pin s of Micro:bit V2	P0	P1	P2
	G (Brown) , V (Red), S (Yellow)	G (Brown) , V (Red), S (Yellow) SERVO 1	G (Brown), V (Red), S (Yellow) SERVO 2

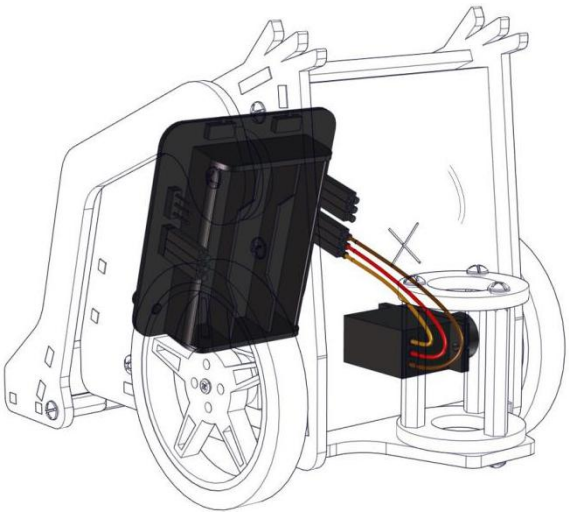
	SERVO 3		



Servo of arm

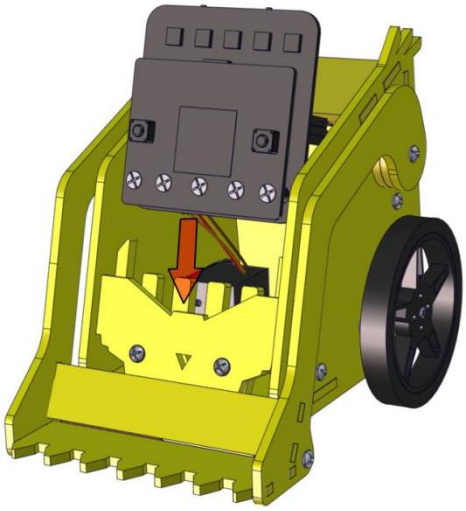


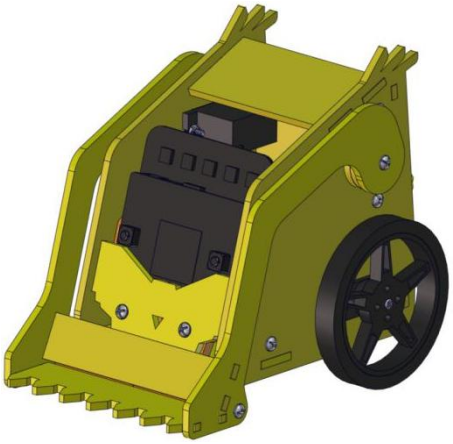
servo of left wheel



servo of right wheel

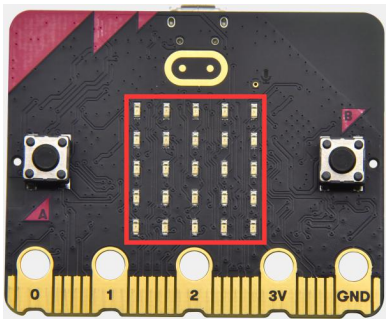
11. Insert the control board with micro:bit V2 into the car





6. Projects:

Project 1: Heartbeat



1.Description:

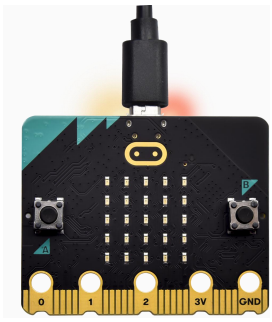
Prepare a Micro:bit V2, a USB cable and a computer. Next we will conduct a basic experiment that a heartbeat pattern flashes on micro:bit board.

2. Components:

- Micro:bit V2 *1
- Micro USB Cable*1

3. Wiring Up:

Interface micro:bit V2 with your computer using micro USB cable.



4.Test Results:

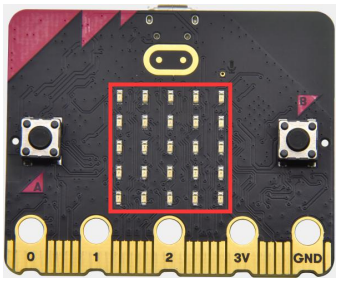
You can enter this website https://makecode.micro:bit.org/reference to get more information even you’ re a starter.

Edit your code in the link: https://makecode.micro:bit.org/

Download code to micro:bit V2 (refer to chapter 4.3), and keep micro USB cable connected. Then image “❤” and “ ” will be shown on micro:bit ceaselessly.

If download unsuccessfully, disconnect micro:bit V2 and reboot it please. Then download code to V2 board again

Project 2: Light Up A Single LED



1. Description:

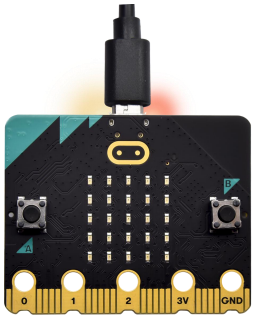
In this project, we will turn on one LED of micro:bit V2.

2. Components:

- Micro:bit V2 *1
- Micro USB Cable*1

3.Wiring Up:

Interface micro:bit V2 with your computer using micro USB cable.

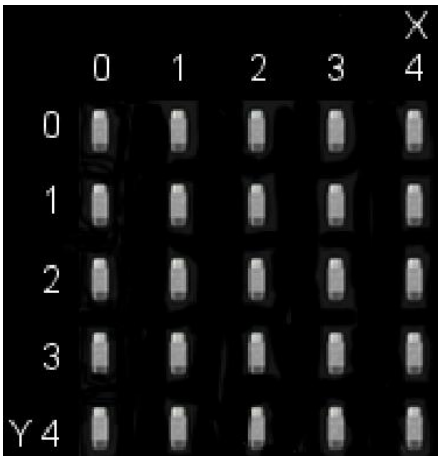


4. Component Overview:

Micro:bit V2 consists of 25 light-emitting diodes, 5 pcs in a group. They correspond to x and y axis. Then the 5*5 matrix is formed. Moreover, every

diode locates at the point of x and y axis.

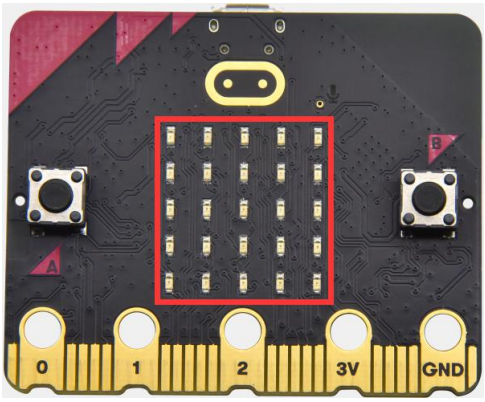
Virtually, we could control an LED by setting coordinate points. For instance, set coordinate point (0, 0) to turn on the LED at row 1 and column 1; light up LED at the row 1 and column 3, we could set (2, 0) and so on.



5.Test Results

Download code to micro:bit V2 and connect it to computer with USB cable, the LED at coordinate point (1,0) flashes for 1 s and the LED at (3,4) blinks for 1s, alternately.

Project 3: 5 x 5 LED Dot Matrix



1.Description:

Dot matrix gains popularity in our life, such as LED screen, bus station and the mini TV in the lift.

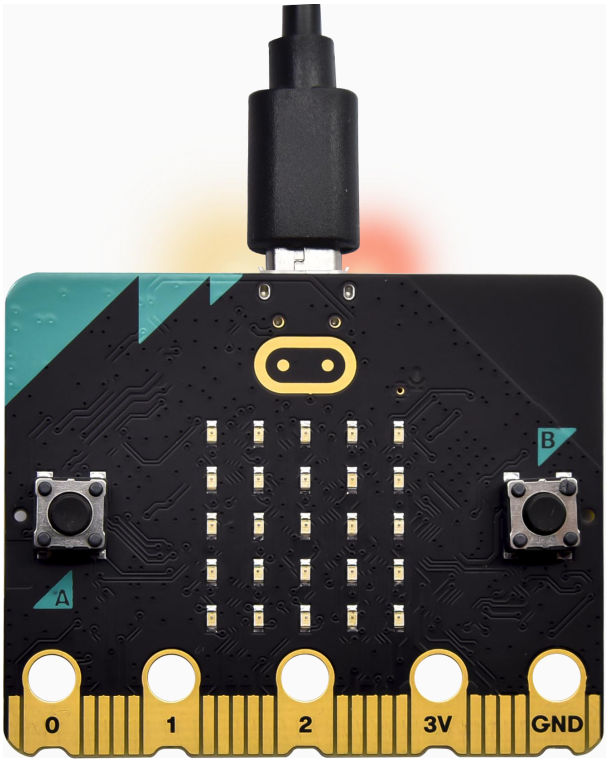
The dot matrix of Micro:bit board consists of 25 light emitting diodes. In previous lesson, we control LED of Micro:bit board to form patterns, numbers and character strings by setting the coordinate points. Moreover, we could adopt another way to complete the display of patterns, numbers and character strings.

2. Components:

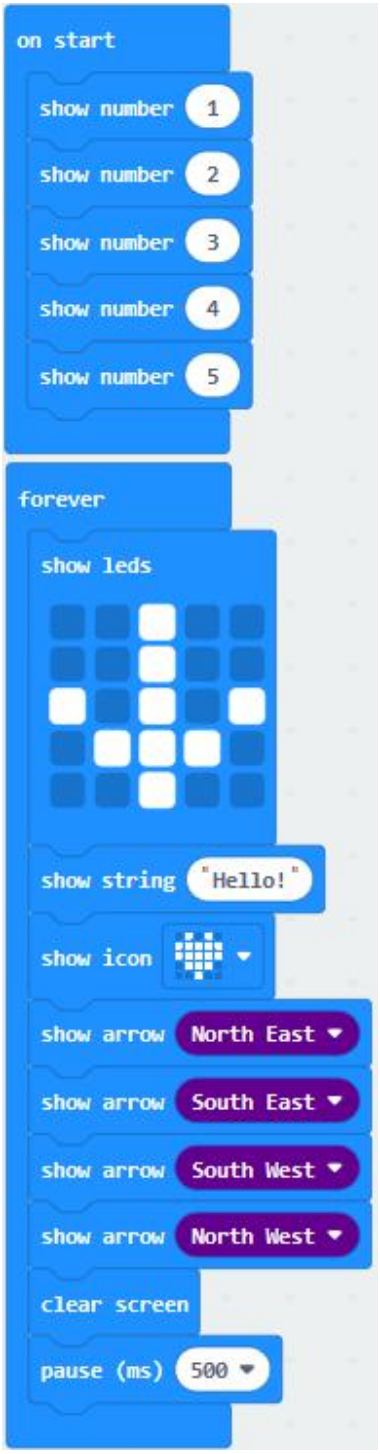
- Micro:bit V2 *1
- Micro USB Cable*1

3. Wiring Up:

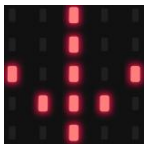
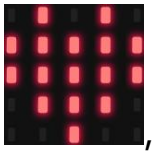
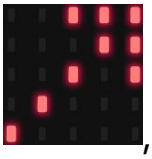
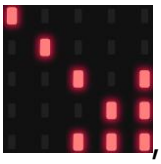
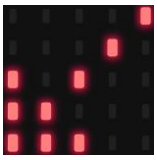
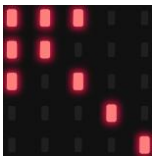
Interface micro:bit V2 with your computer using micro USB cable.



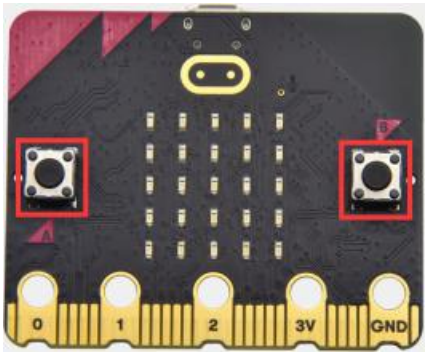
4. Test Code:



5.Test Results:

Download code to micro:bit V2, and and keep USB cable connected. Micro:bit V2 will display 1, 2, 3, 4 and 5 and separately show  icon, "Hello!" ,  ,  ,  ,  and  patterns.

Project 4: Programmable Buttons



1. Description:

The circuit is controlled by button. The circuit is connected when the button is pressed; however, the circuit is disconnected when released.

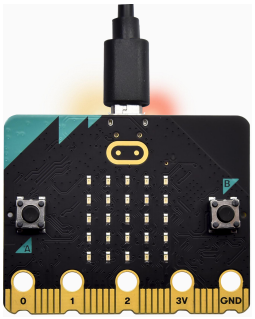
Micro:bit V2 has three buttons which are the reset button on the back and two programmable buttons(A, B) on the front.

Let’ s do experiments to know how they works

2. Components:

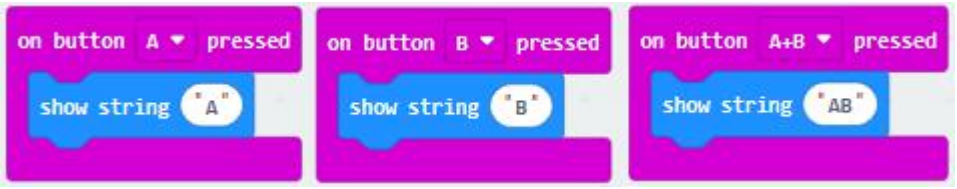
- Micro:bit V2 *1
- Micro USB Cable*1

3.Wiring Up:



Interface micro:bit V2 with your computer using micro USB cable.

4.Test Code 1:

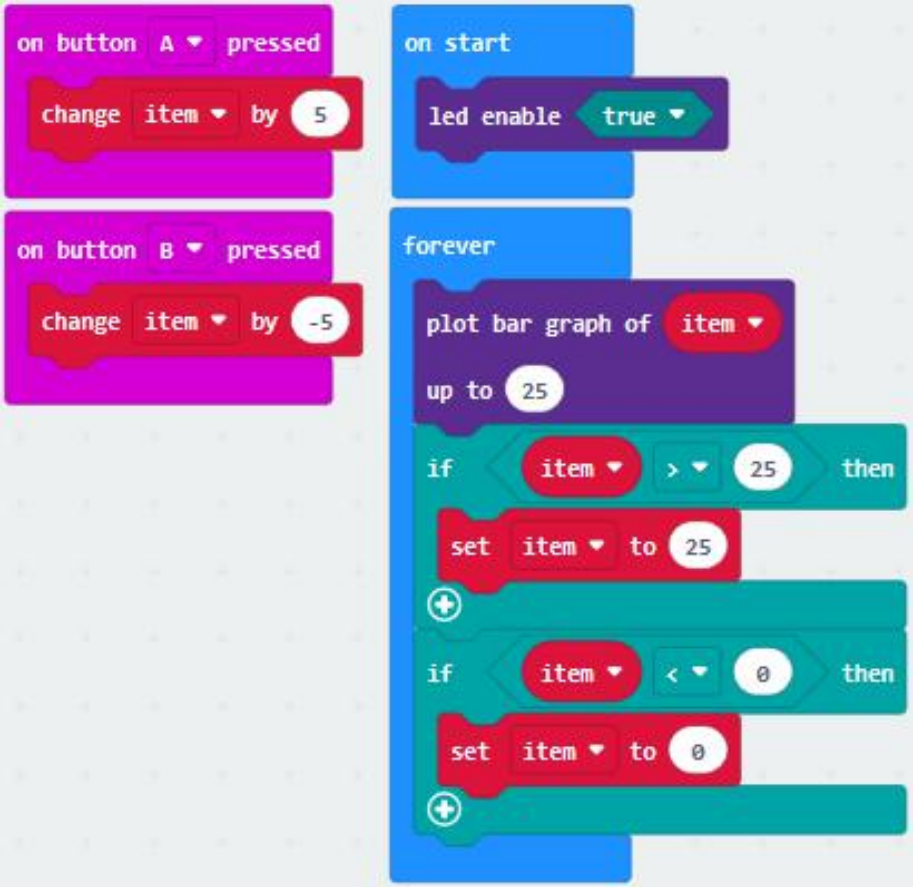


5. Test Results 1:

Download code to micro:bit V2 and keep USB cable connected.

5×5 LED dot matrix will show “A” if button A is pressed, in case that button B is pressed, “B” will appear. So will micro:bit V2 show “AB” if you press A and B buttons simultaneously.

6.Test Code 1:



7.Test Results 2:

Download code to micro:bit V2 and keep USB cable connected. A row of luminous LEDs are added if button A is pressed; and when B is pressed, a row of luminous LEDs are deducted.

Project 5: Temperature Measurement

1.Description:

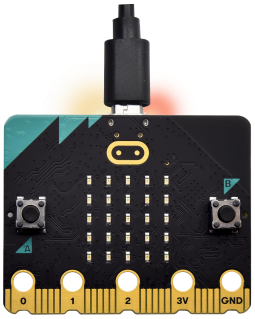
We will introduce how to detect ambient temperature by micro:bit V2. Its detection range is -40℃~105℃.

2.Components:

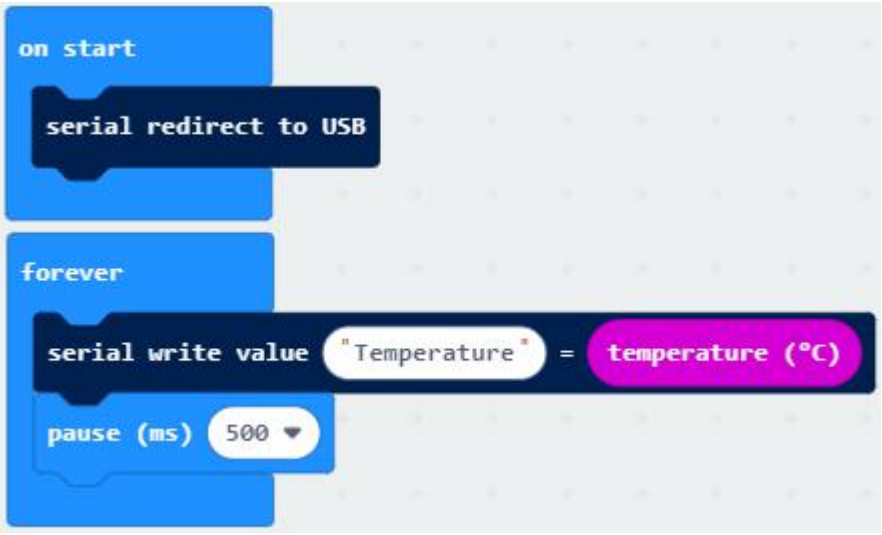
- Micro:bit V2 *1
- Micro USB Cable*1

3.Wiring Up:

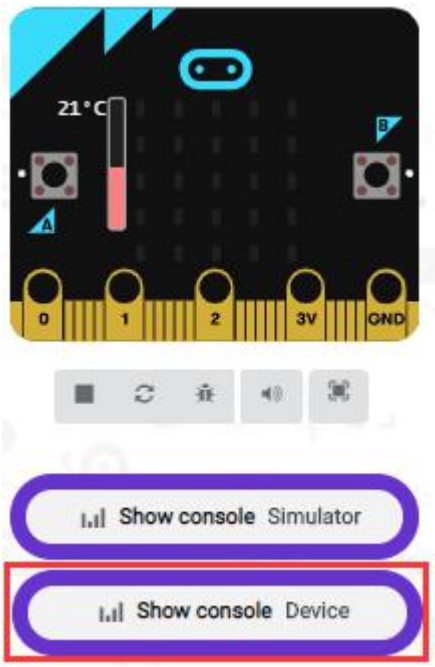
Interface micro:bit V2 with your computer using micro USB cable.



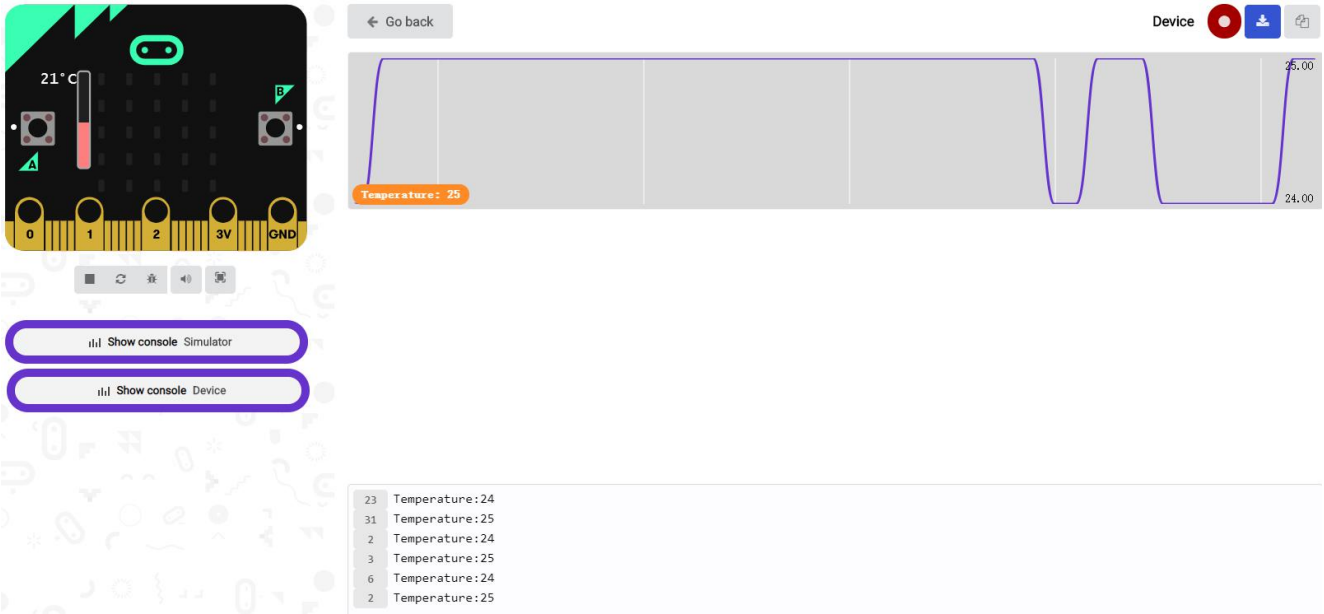
4.Test Code and Results:



Download code to micro:bit V2 and plug in power with USB cable. Then click “Show console Device” button.



Open serial interface and display the temperature value, as shown below:

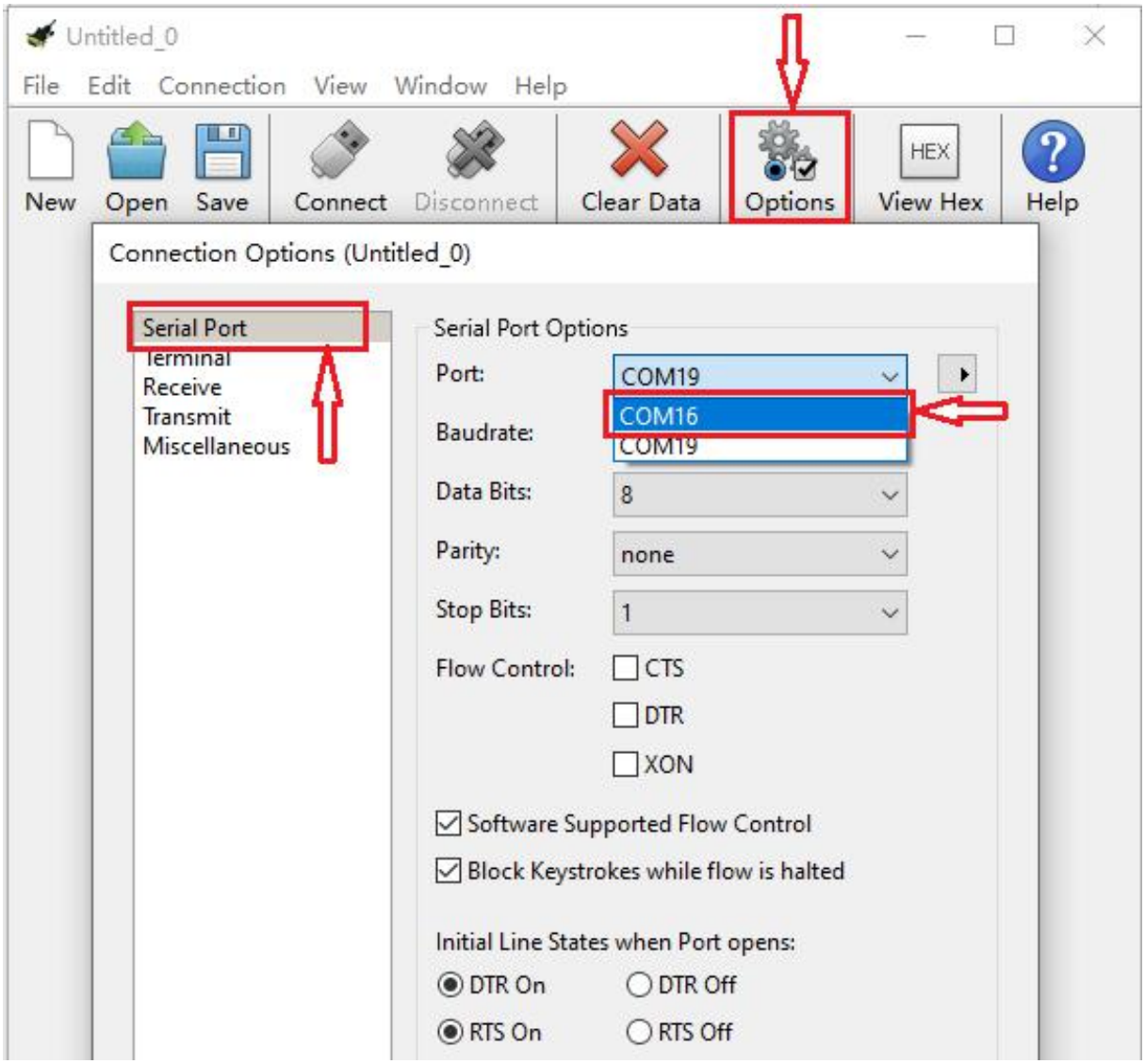


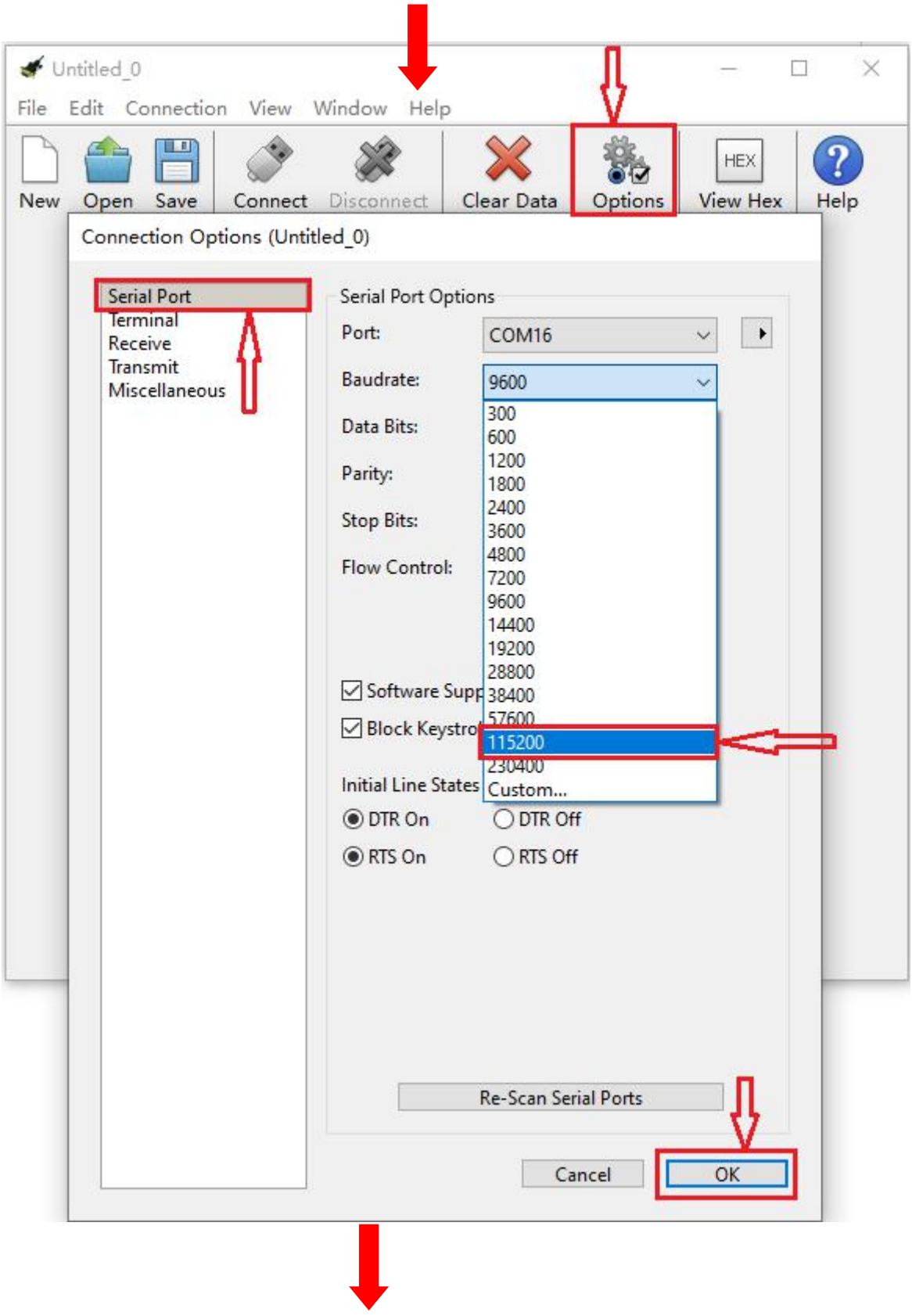
If your computer system is Windows7/8 instead of Windows 10, the device can’ t be paired in Google Chrome, as a result, the digital and analog signals can’ t be read.

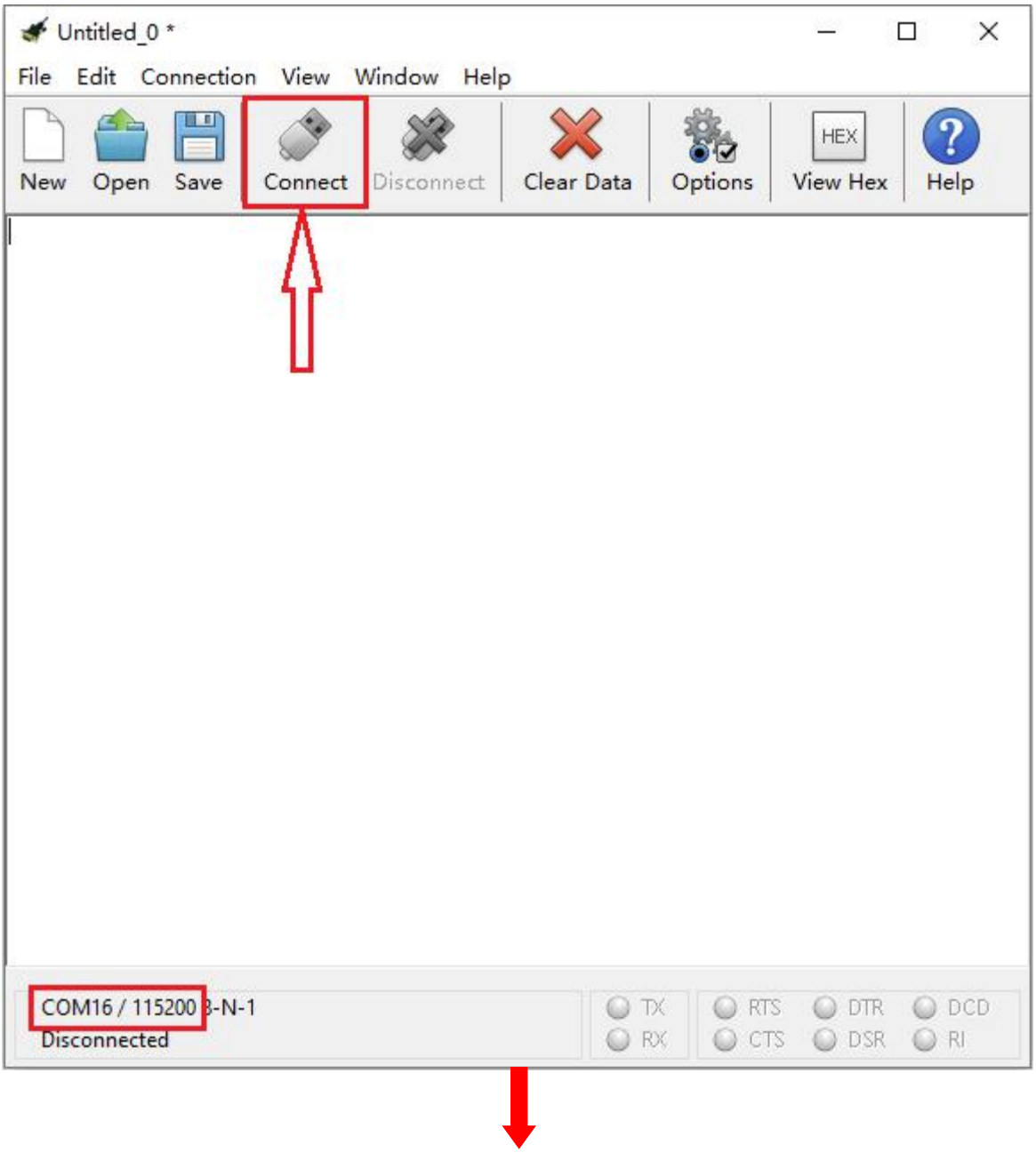
Here, we need CoolTerm software to read data.

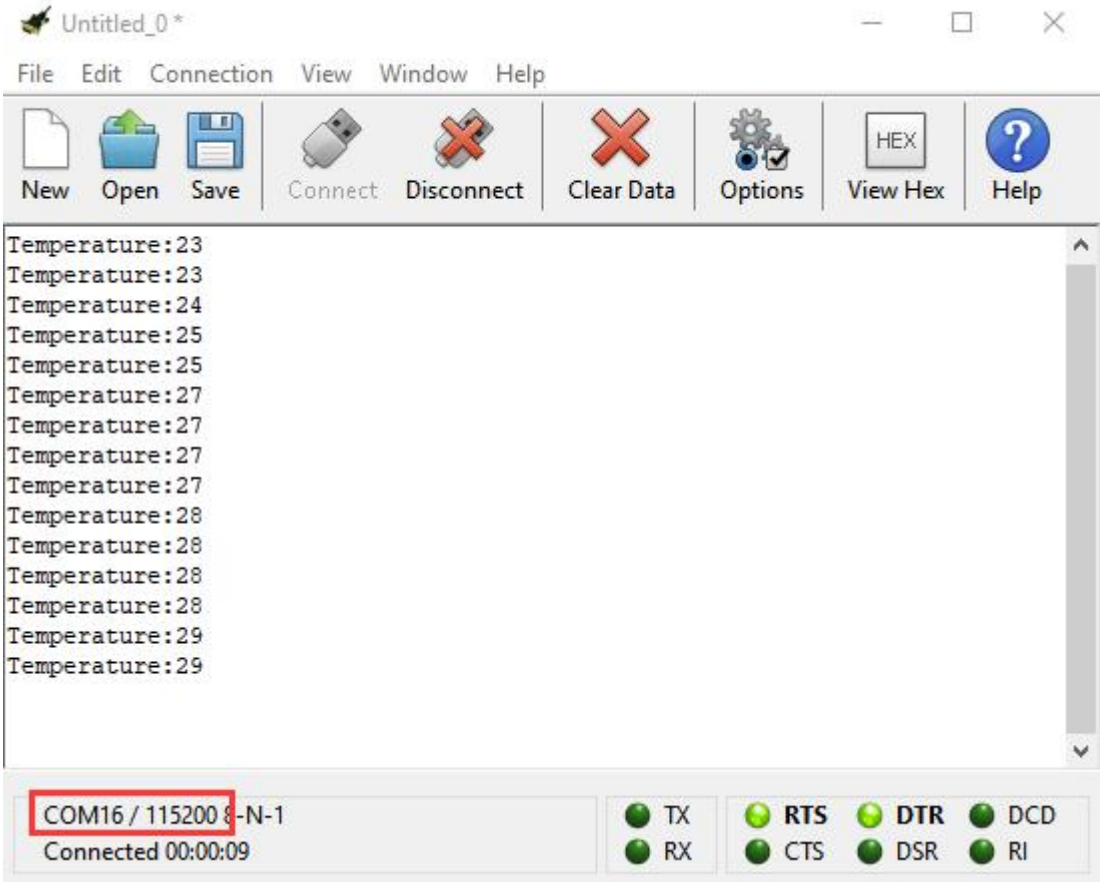
Open CoolTerm, click Options to select SerialPort. Set COM port and 115200 baud rate(the baud rate of USB serial communication of micro:bit V2 is 115200 through the test). Click "OK" and "Connect".

The serial monitor shows the current ambient temperature value, as shown below:

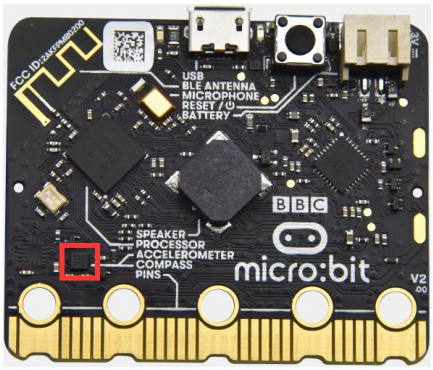



Untitled_0
File Edit Connection View Window Help
New Open Save Connect Disconnect Clear Data Options View Hex Help
Connection Options (Untitled_0)
Serial Port
Terminal
Receive
Transmit
Miscellaneous
Serial Port Options
Port: COM16
Baudrate: 9600
Data Bits:
Parity:
Stop Bits:
Flow Control:
300
600
1200
1800
2400
3600
4800
7200
9600
14400
19200
28800
38400
57600
115200
230400
Custom...
Software Supp
Block Keystro
Initial Line States
DTR On
DTR Off
RTS On
RTS Off
Re-Scan Serial Ports
Cancel
OK


Untitled_0 *
File Edit Connection View Window Help
New
Open
Save
Connect
Disconnect
Clear Data
Options
HEX
View Hex
Help
COM16 / 115200
Disconnected
TX
RX
RTS
CTS
DTR
DSR
DCD
RI



Project 6: Geomagnetic sensor



1.Description:

This project mainly introduces the use of the Micro:bit’ s compass. In addition to detecting the strength of the magnetic field, it can also be used to determine the direction, an important part of the heading and attitude reference system (AHRS) as well.

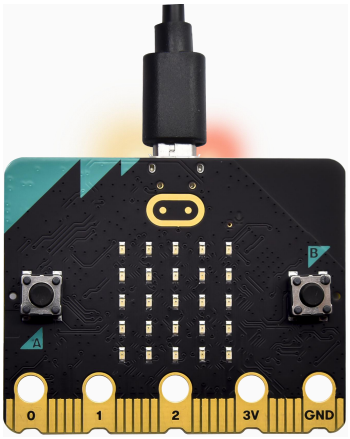
It uses LSM303AGR three-axis magnetometer whose the range of magnetic field is ±50 gauss. In this project, we will introduce how compass detect data and determine direction.

Then we can read the value detected by it to determine the location. We need to calibrate the micro:bit V2 when magnetic sensor works.

2. Components:

- Micro:bit V2 *1
- Micro USB Cable*1

3. Wiring Up:



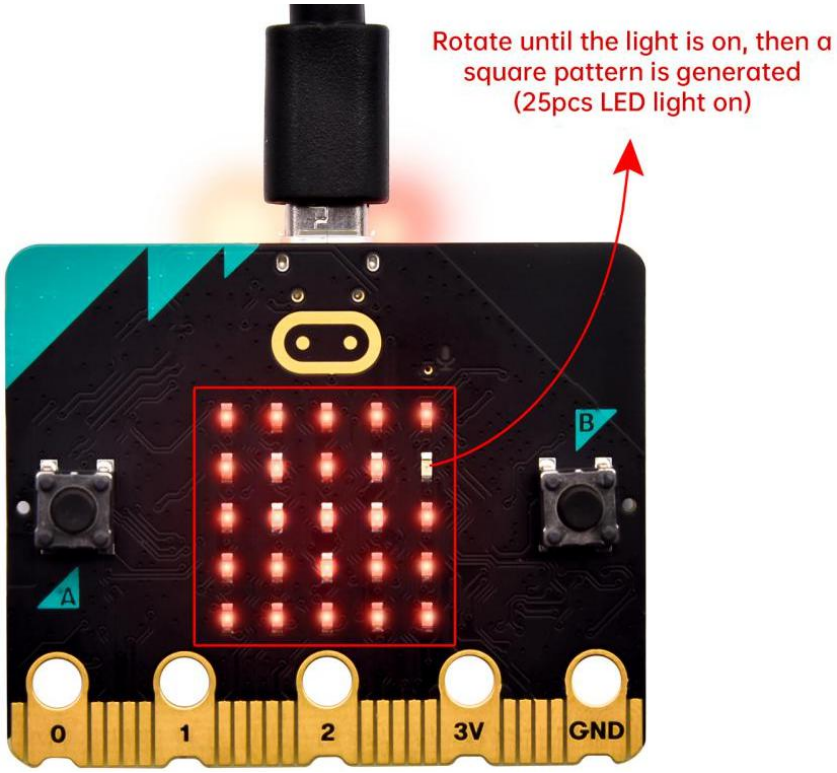
Interface micro:bit V2 with your computer using micro USB cable

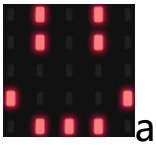
4. Test Code and Results 1:

Download code to micro:bit V2 and keep USB connected.

As the button A is pressed, LED dot matrix indicates that "TILT TO FILL SCREEN" then enter the calibration interface.

The calibration method: rotate the micro:bit V2 to make LED dot matrix display a full square (25 LEDs are on), as shown in the following figure:

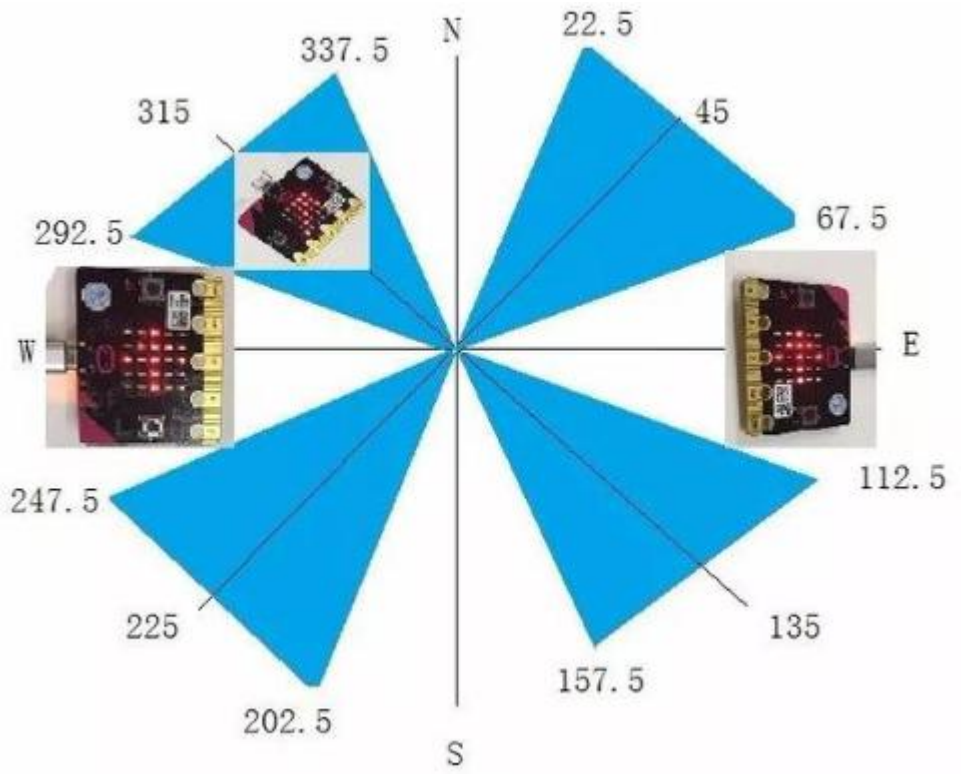


The calibration won’ t be finished until you view the smile pattern  appear.

The serial monitor will show 0°, 90°, 180° and 270° when button A is pressed.

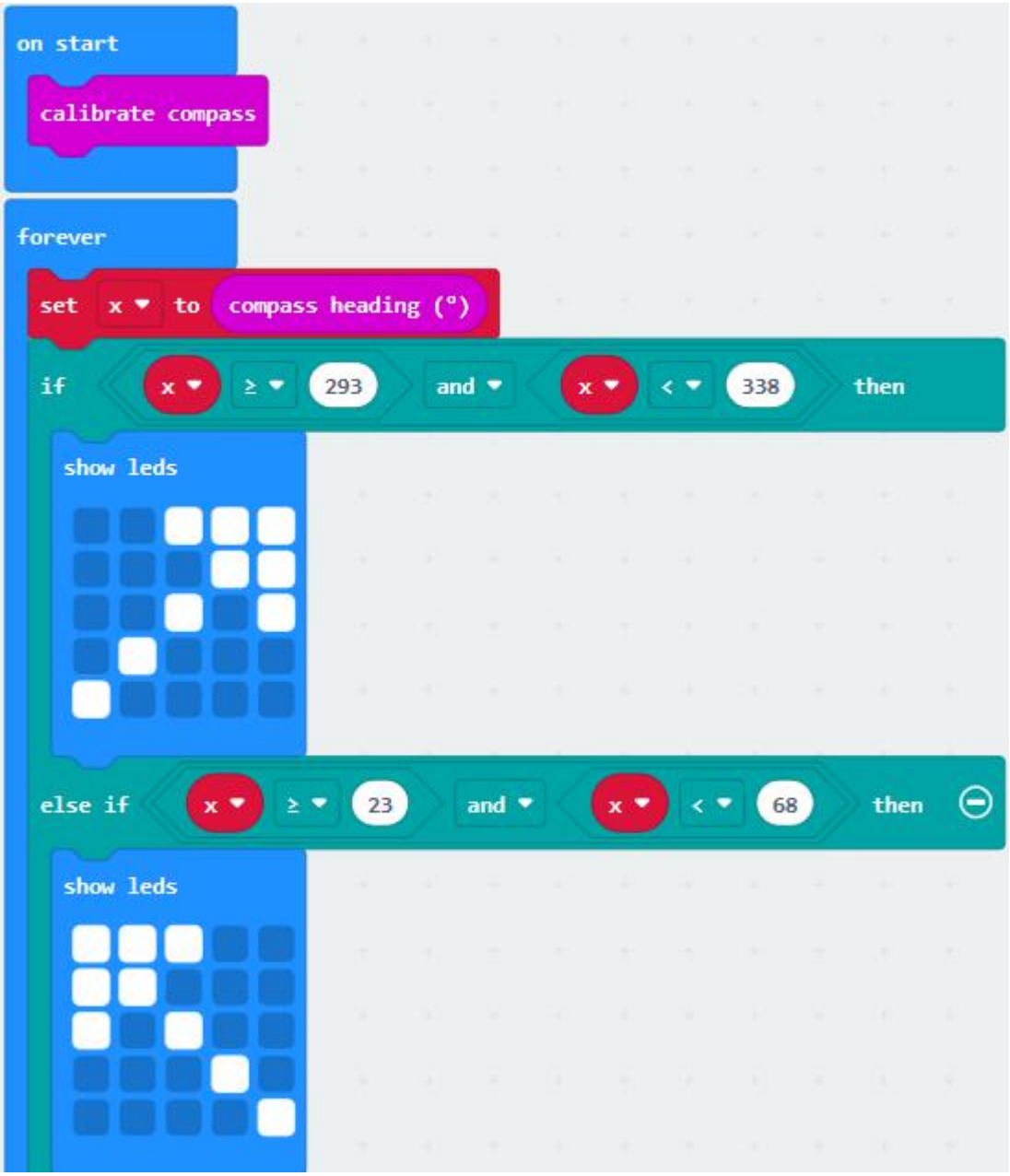
5. Test Code and Results 2:

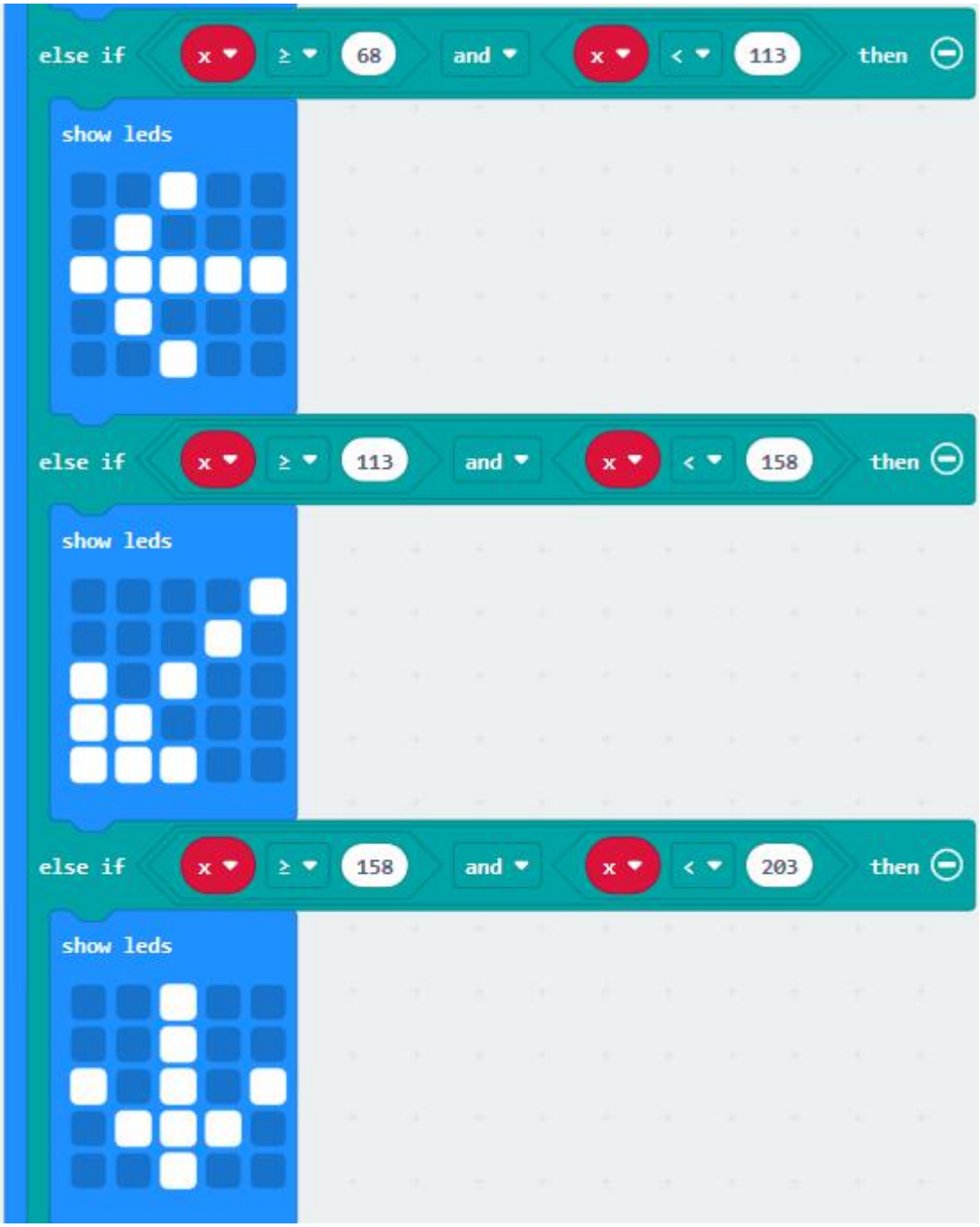
The above code means that the direction is North and the value of magnetometer is read continuously.

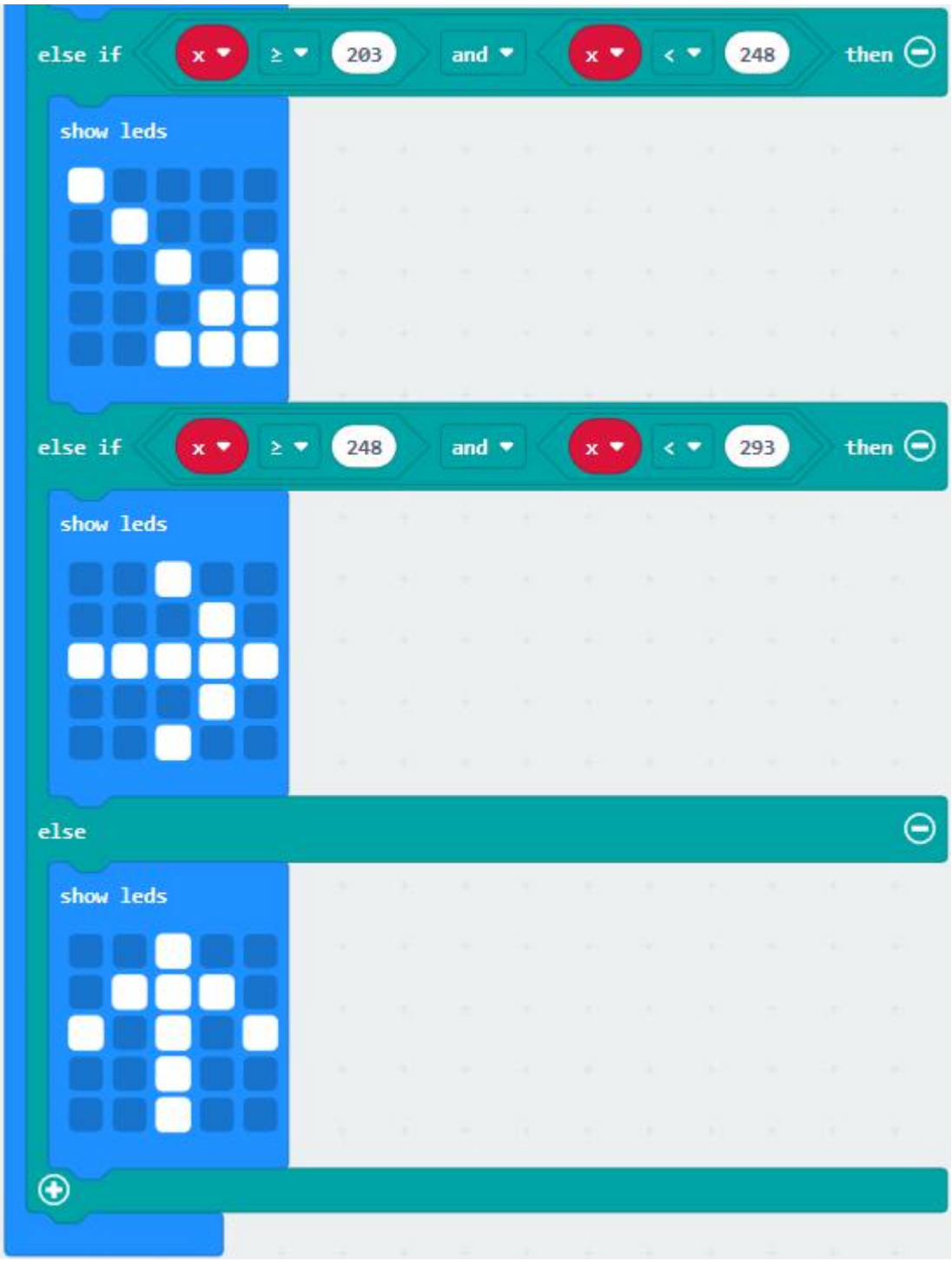


The micro:bit V2 shows the  icon, if the value is between 292.5 and 337.5. The value should be 293 and 338 because decimal is not allowed to be filled in the code.

Complete Test Code 2:




else if x ≥ 68 and x < 113 then
show leds
else if x ≥ 113 and x < 158 then
show leds
else if x ≥ 158 and x < 203 then
show leds



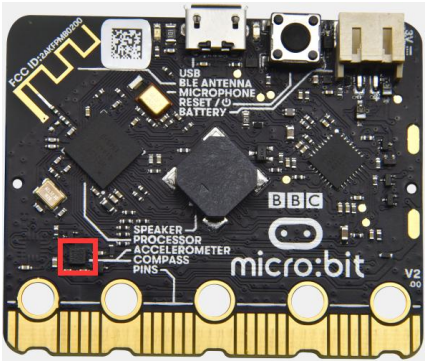
6. Test Result2:

Download code to micro:bit V2 and keep USB cable connected.

After calibration(see the result1) and tilt micro:bit V2, the direction signs

will be shown.

Project 7: Accelerometer



1. Description:

The micro:bit V2 has a built-in LSM303AGR three-axis acceleration sensor (accelerometer). Its I2C interface works on external communication, the range can be set to 1g, 2g, 4g and 8g.

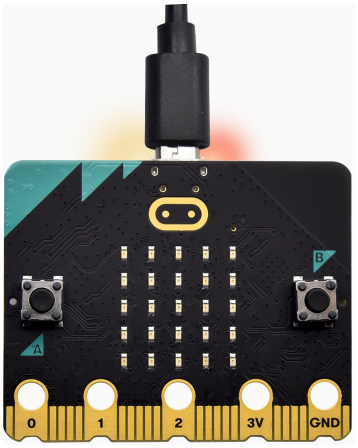
We usually detect the posture of accelerometer.

In this project, we will check the value detected by accelerometer.

2. Components:

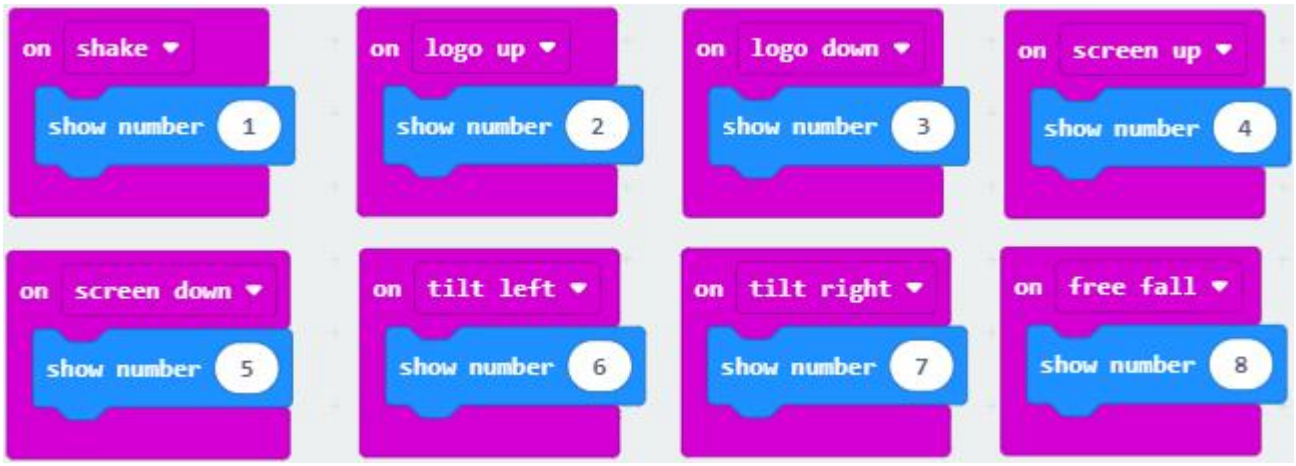
- Micro:bit V2 *1
- Micro USB Cable*1

3. Wiring Up:



Interface micro:bit V2 with your computer using micro USB cable

4. Test Code1and Results 1:



Download code to micro:bit V2 and keep USB cable connected.

Micro:bit V2 will display 1 if shaken.

Place micro:bit V2 vertically(logo up), then the number 2 is displayed:

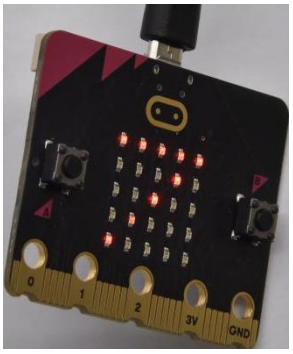
Place micro:bit V2 vertically(logo down), then the number 3 is displayed:

Place micro:bit V2 horizontally (facing up), then the number 4 is displayed:

On the contrary, place micro:bit V2 horizontally (facing down), then the number 5 is displayed:

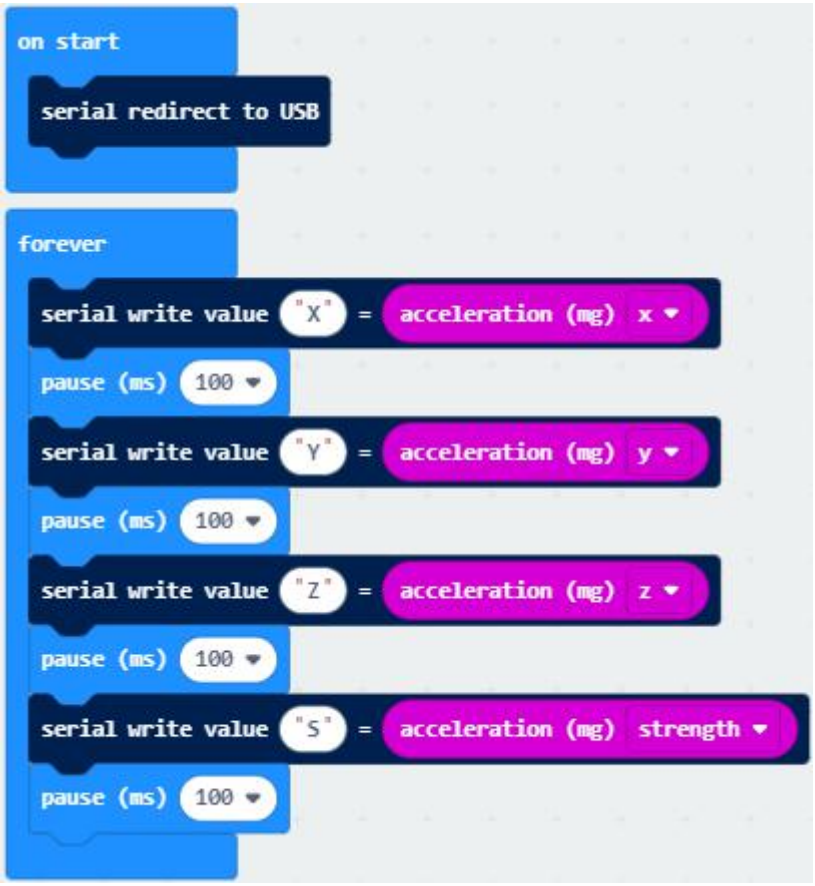
When Micro:bit board is tilt to the left, number 6 is shown.

When Micro:bit board is inclined to the right, number 7 is displayed.

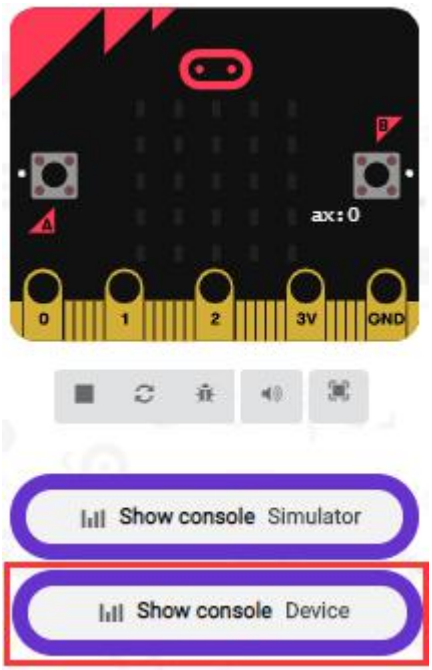


When it is free fall(accidentally making it fall), number 8 will appear on dot matrix. (Note：we don’ t recommend you to make it free fall, it will make board damage)

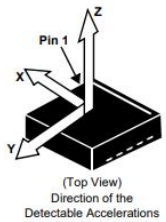
5.Test Code and Results 2：

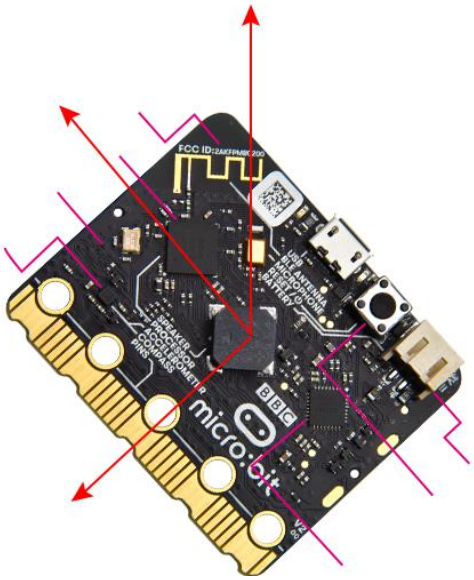


Download code to micro:bit V2, keep USB cable connected, and click "Show Console Device"



According to MMA8653FC manual, the acceleration coordinates of the accelerometer are shown in the following figure:





The decomposition value of acceleration on the X-axis, Y-axis, and Z-axis,

and the synthesis value of acceleration (the synthesis of gravitational acceleration and other external forces) are shown below:

If your computer system is Windows7/8 instead of Windows 10, the device can’ t be paired in Google Chrome, as a result, the digital and analog signals can’ t be read.

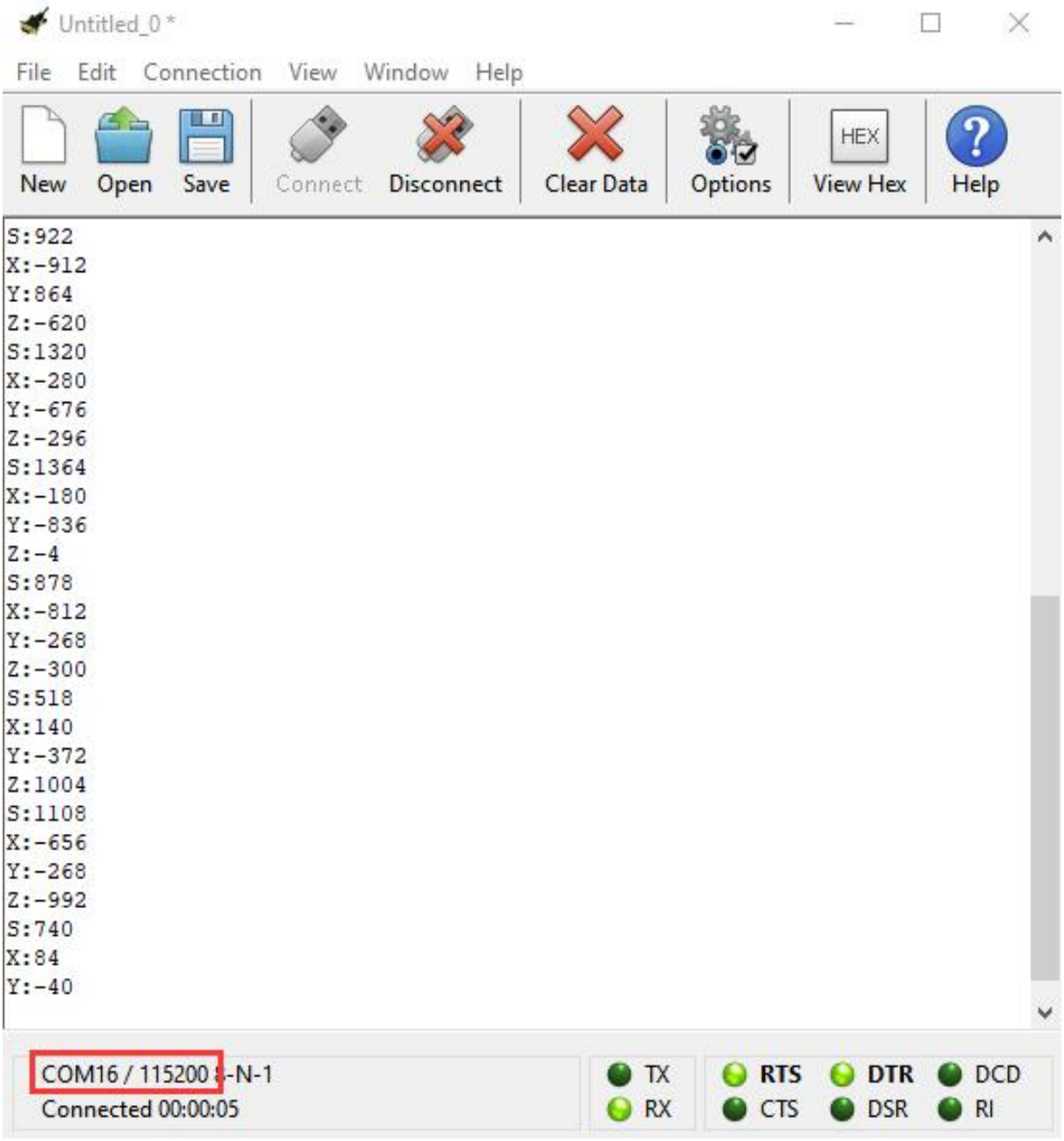
Here, we need CoolTerm software to read data.

Open CoolTerm, click Options to select SerialPort.

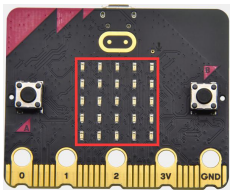
Set COM port and 115200 baud rate(the baud rate of USB serial communication of Micro:bit is 115200 through the test).

Click “OK” and “Connect”.

CoolTerm serial monitor displays the acceleration value on x, y and z axis, as shown below:


Untitled_0 *
File Edit Connection View Window Help
New Open Save Connect Disconnect Clear Data Options HEX View Hex Help
S:922
X:-912
Y:864
Z:-620
S:1320
X:-280
Y:-676
Z:-296
S:1364
X:-180
Y:-836
Z:-4
S:878
X:-812
Y:-268
Z:-300
S:518
X:140
Y:-372
Z:1004
S:1108
X:-656
Y:-268
Z:-992
S:740
X:84
Y:-40
COM16 / 115200 8-N-1
Connected 00:00:05
TX
RX
RTS
CTS
DTR
DSR
DCD
RI

Project 8: Detect Light Intensity by Micro:bit



1.Description:

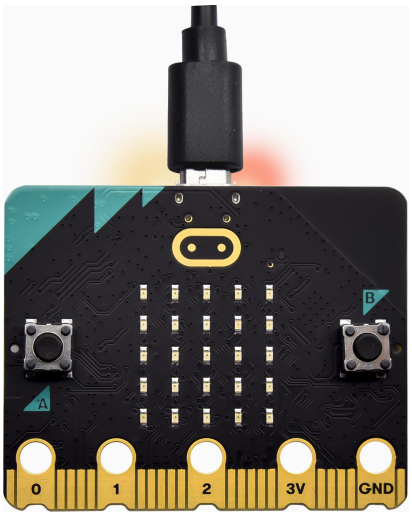
This project will introduce how micro:bit V2 detects the external light intensity. Since micro:bit doesn’ t come with photosensitive sensor, the detection of light intensity is completed through the LED matrix. When the light irradiates the LED matrix, the voltage change will be produced. Therefore, we could determine the light intensity by voltage change.

2. Components:

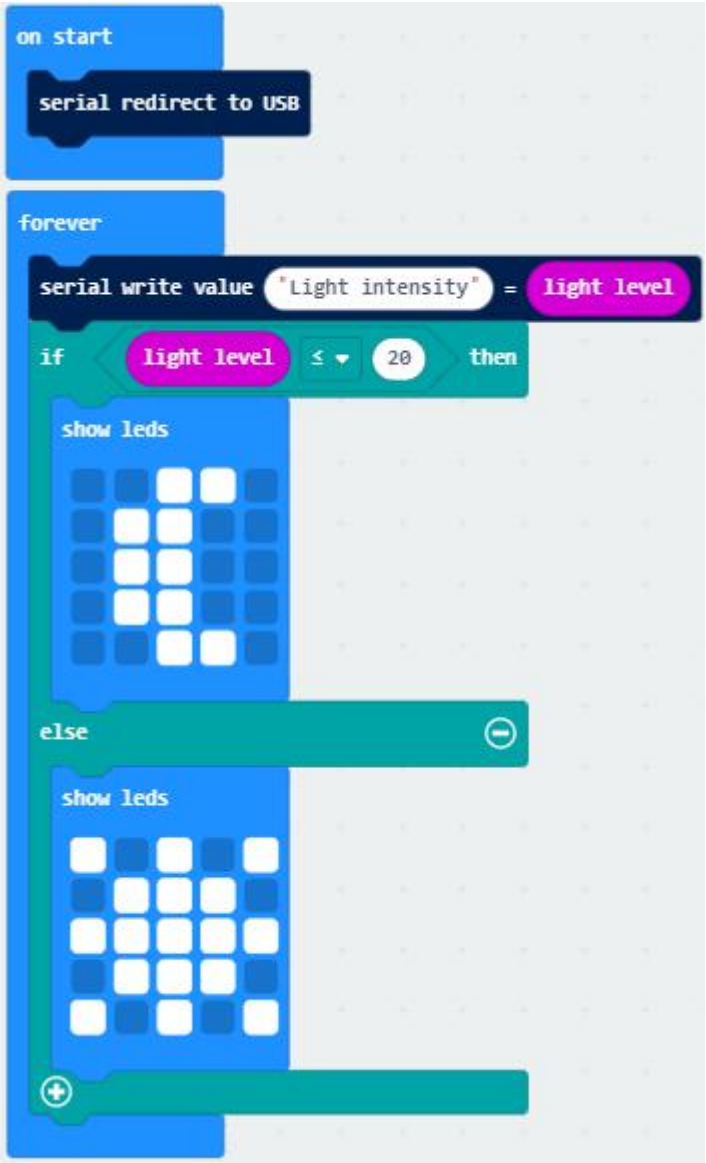
- Micro:bit V2 *1
- Micro USB Cable*1

3.Wiring Up:

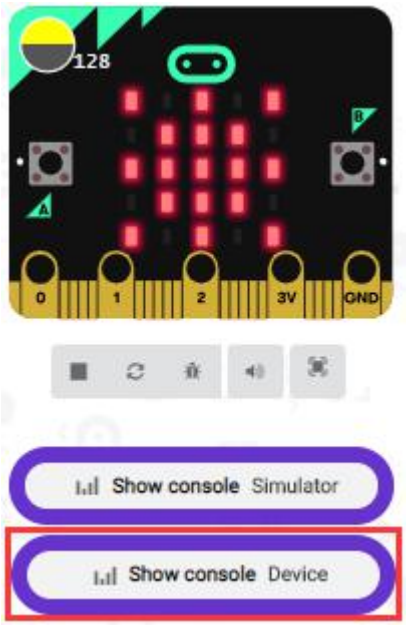
Interface micro:bit V2 with your computer using micro USB cable



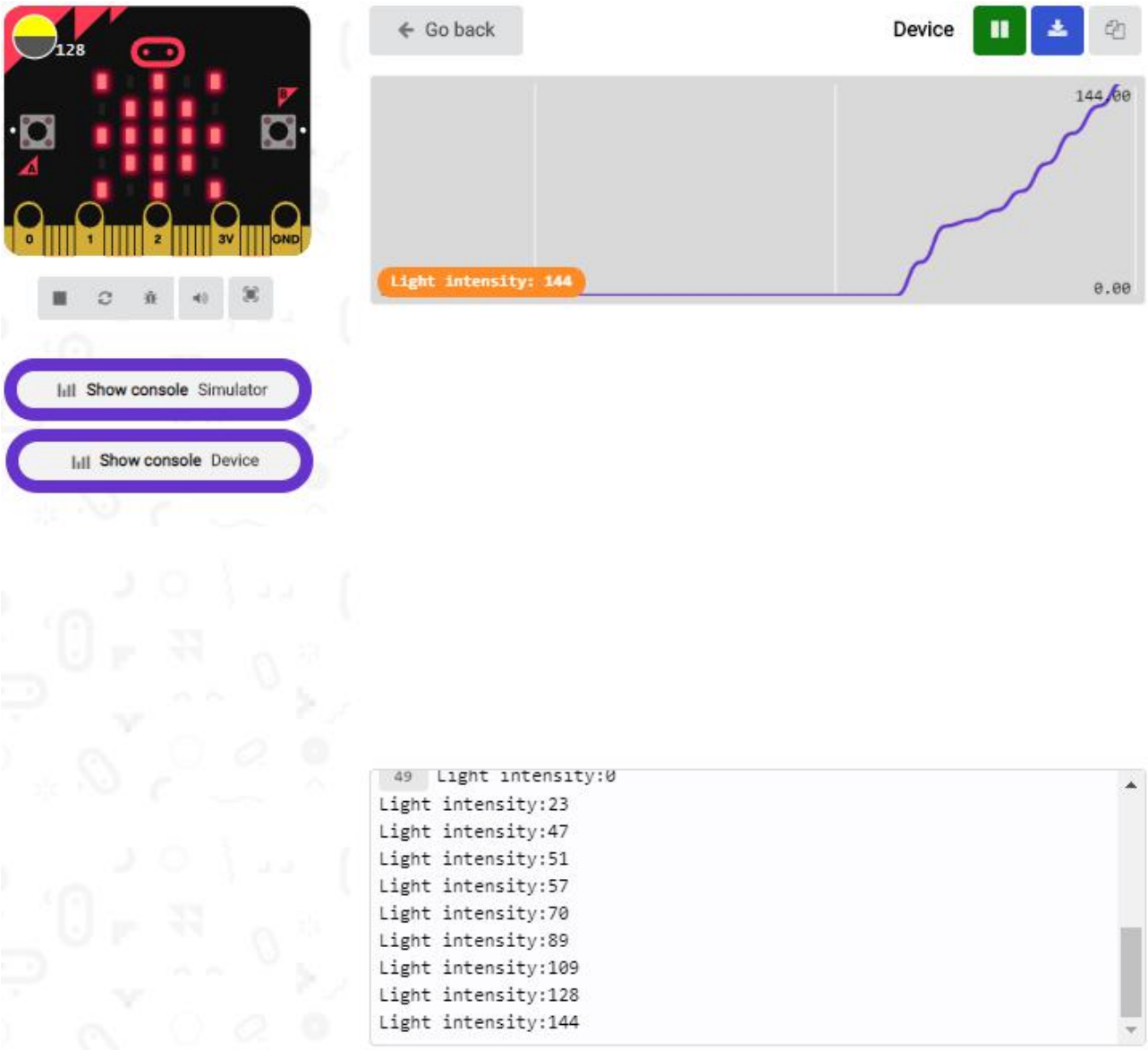
4. Test Code and Test Result:



Download code to micro:bit V2 and keep USB cable connected, and click "Show Console Device"



The intensity value is 0 when covering LED dot matrix. And the value varies with the light intensity. When placing micro:bit V2 under the sunlight, the stronger the light is, and the larger the intensity value is. As shown below:



Number 20 is a random light intensity value we set. Micro:bit V2 will show "moon" picture when the light intensity is less than or equivalent to 20; however, the "sun" image will appear if the value is more than 20.

If your computer system is Windows7/8 instead of Windows 10, the device can't be paired in Google Chrome, as a result, the digital and analog

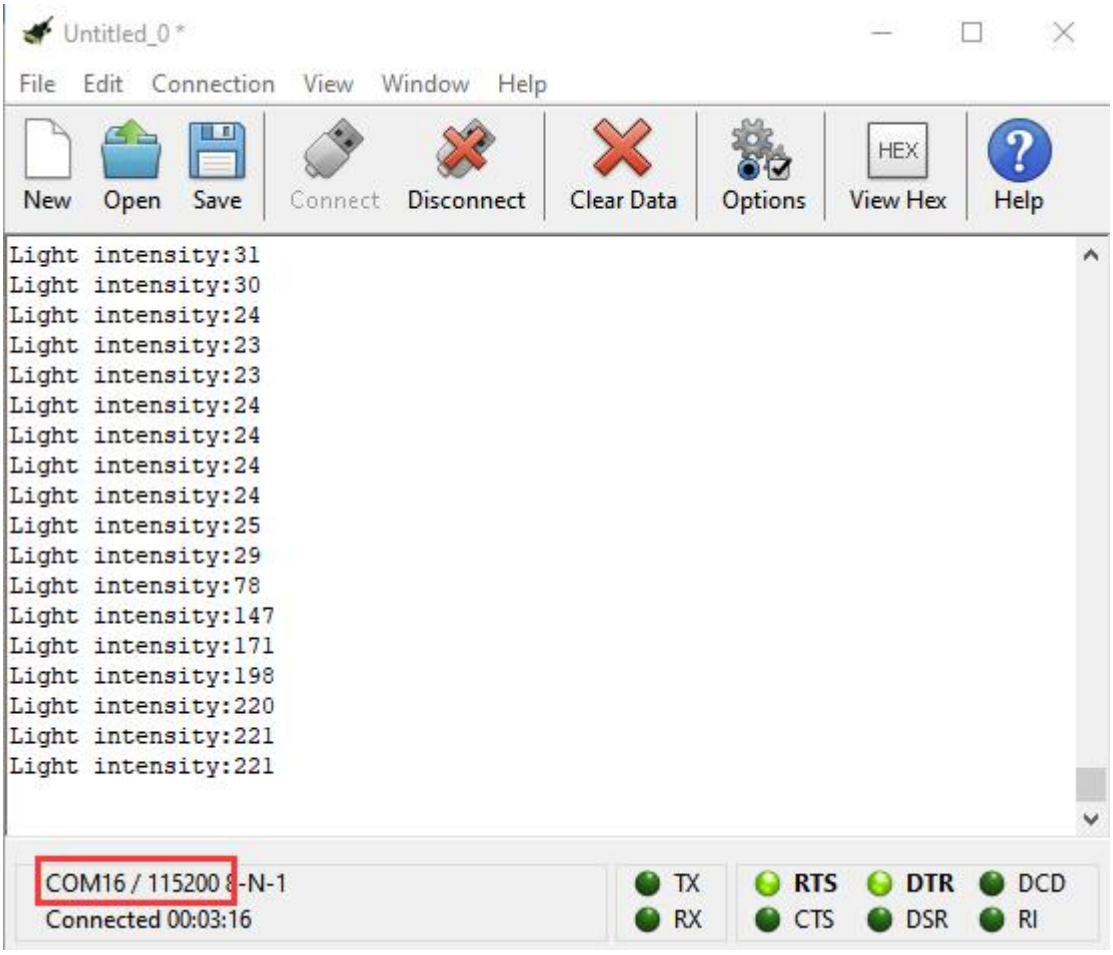
signals can’ t be read.

Here, we need CoolTerm software to read data.

Open “CoolTerm”, click “Options” to select “SerialPort”, and set “COM” port and 115200 baud rate(the baud rate of USB serial communication of micro:bit V2 is 115200 through the test).

Then click “OK” and “Connect”.

The light intensity value is shown below:



Project 9: Speaker

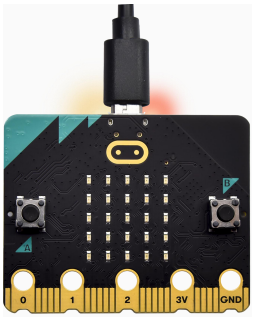
1. Description:

The micro:bit V2 has built-in speaker for emitting different tones. You can composite a song like “Ode to Joy” and other beautiful songs.

2.Components:

- Micro:bit V2 *1
- Micro USB Cable*1

3.Wiring Up:



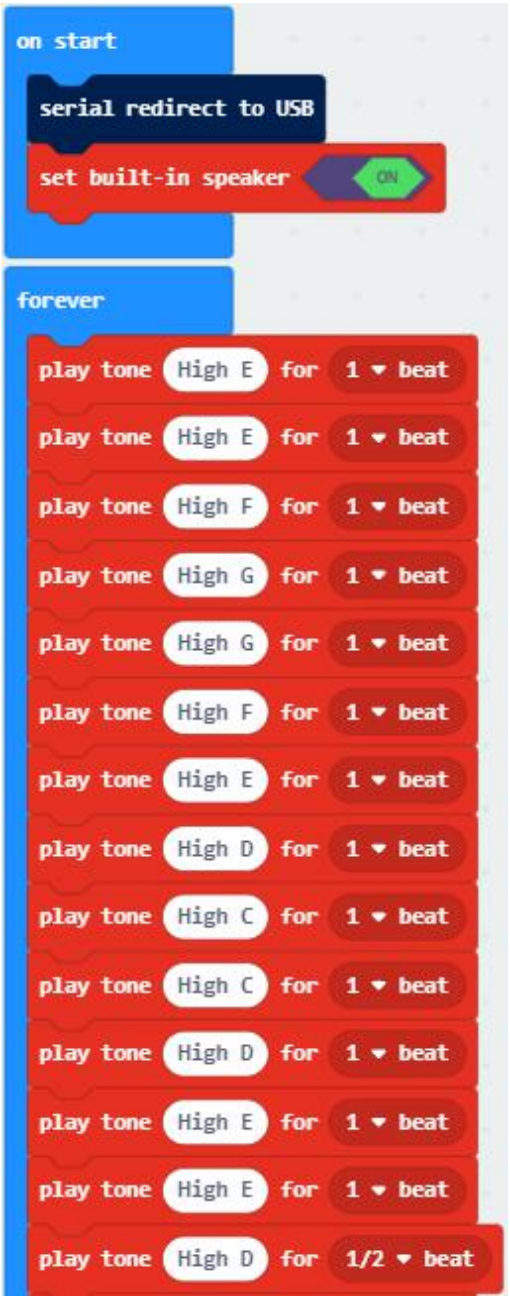
Interface micro:bit V2 with your computer using micro USB cable

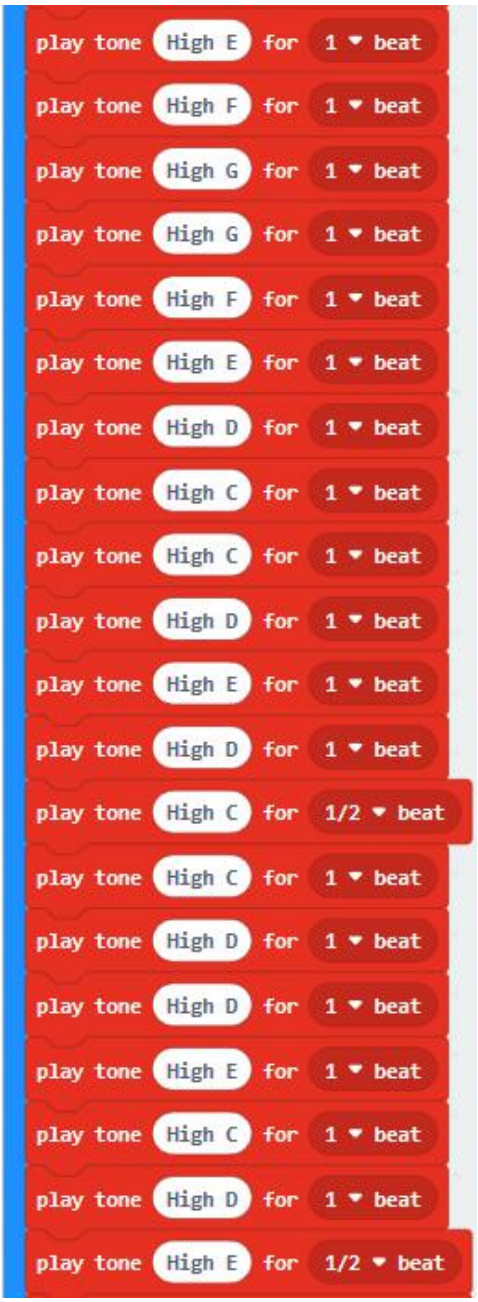
4.Test Code and Results 1:

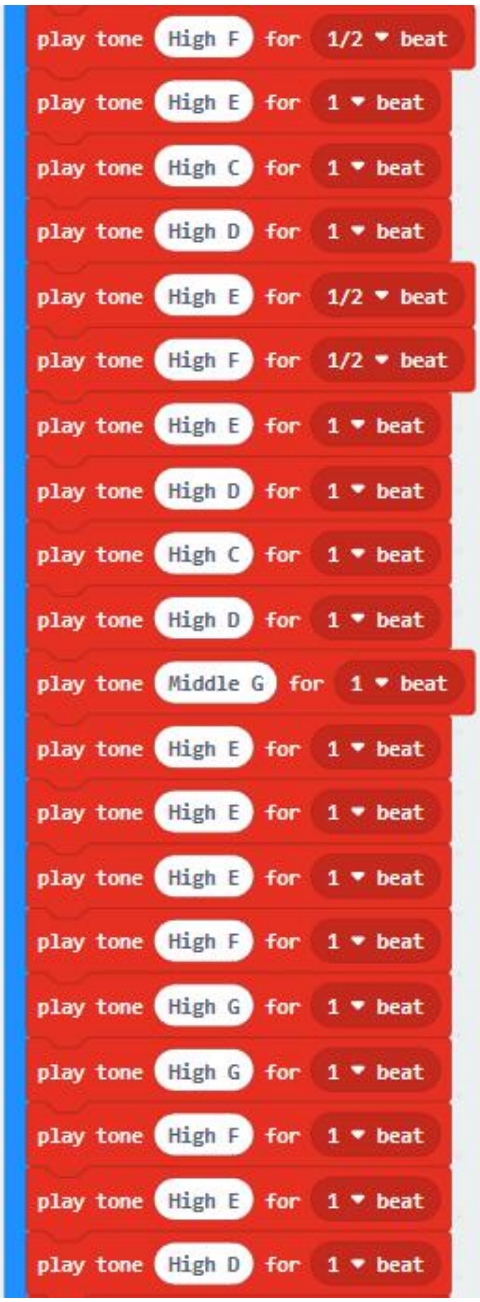
Download code to micro:bit V2 and plug in power with USB cable.

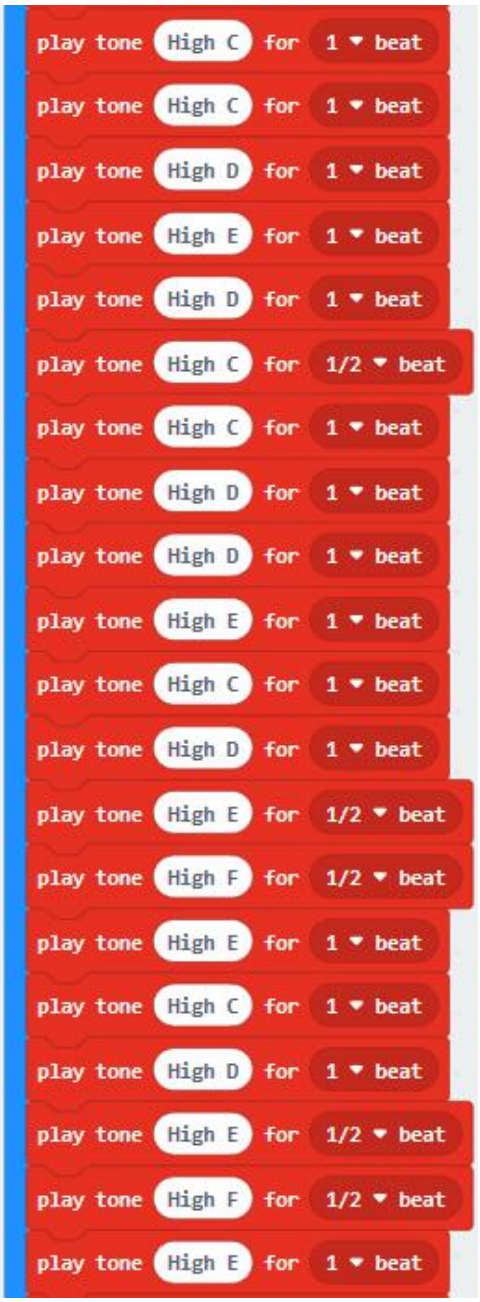
Then micro：bit V2 shows music icon and emits sound.

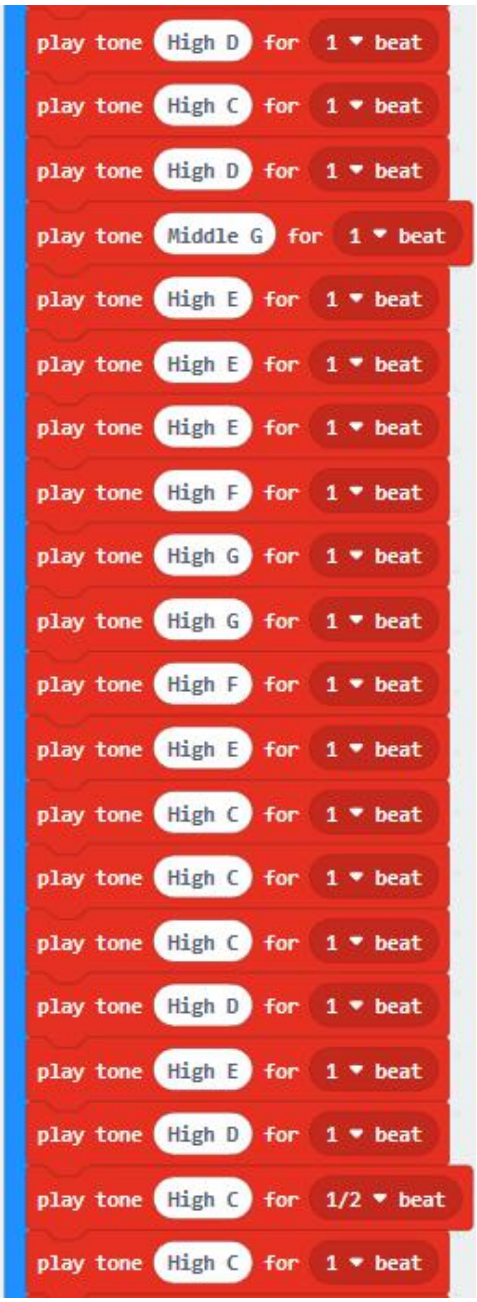
5.Test Code and Results 2:

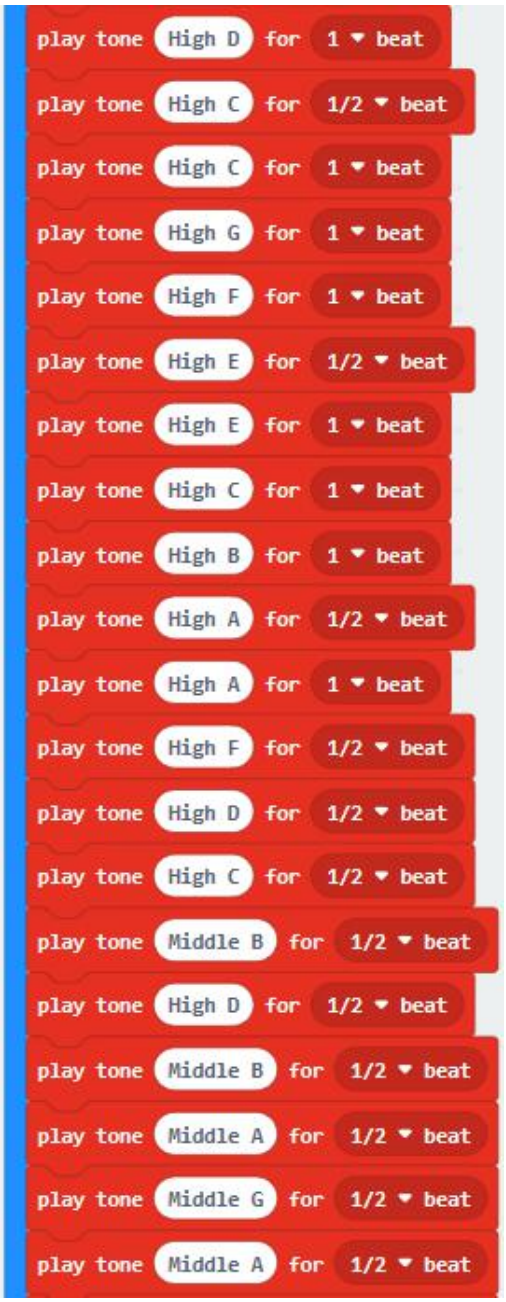

on start
serial redirect to USB
set built-in speaker ON
forever
play tone High E for 1 beat
play tone High E for 1 beat
play tone High F for 1 beat
play tone High G for 1 beat
play tone High G for 1 beat
play tone High F for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High C for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1 beat
play tone High E for 1 beat
play tone High D for 1/2 beat

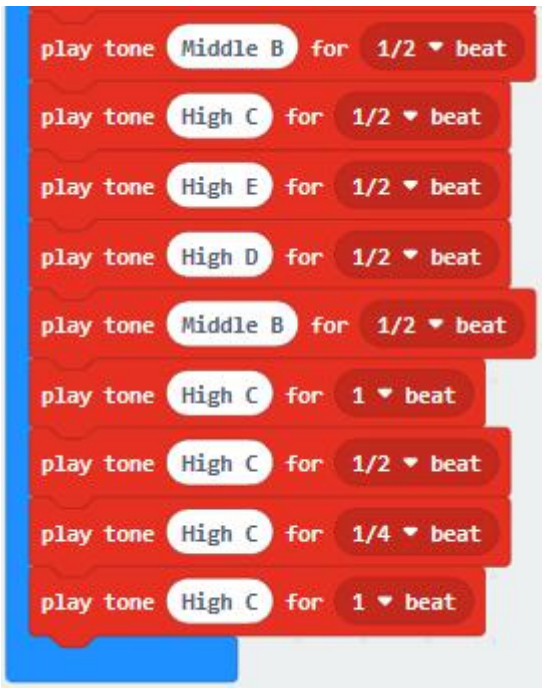

play tone High E for 1 beat
play tone High F for 1 beat
play tone High G for 1 beat
play tone High G for 1 beat
play tone High F for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High C for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High C for 1/2 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High D for 1 beat
play tone High E for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1/2 beat


play tone High F for 1/2 beat
play tone High E for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1/2 beat
play tone High F for 1/2 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone Middle G for 1 beat
play tone High E for 1 beat
play tone High E for 1 beat
play tone High E for 1 beat
play tone High F for 1 beat
play tone High G for 1 beat
play tone High G for 1 beat
play tone High F for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat

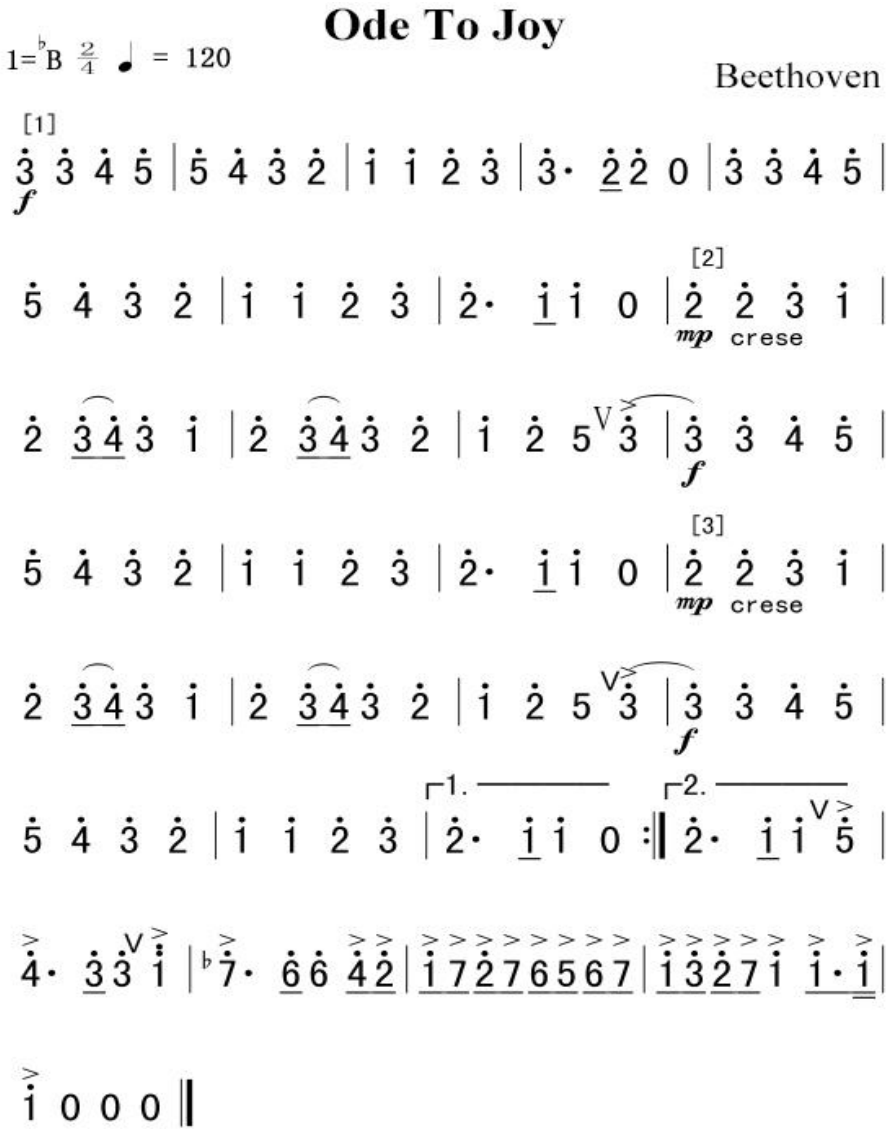

play tone High C for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High C for 1/2 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High D for 1 beat
play tone High E for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1/2 beat
play tone High F for 1/2 beat
play tone High E for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1/2 beat
play tone High F for 1/2 beat
play tone High E for 1 beat


play tone High D for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone Middle G for 1 beat
play tone High E for 1 beat
play tone High E for 1 beat
play tone High E for 1 beat
play tone High F for 1 beat
play tone High G for 1 beat
play tone High G for 1 beat
play tone High F for 1 beat
play tone High E for 1 beat
play tone High C for 1 beat
play tone High C for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High C for 1/2 beat
play tone High C for 1 beat


play tone High D for 1 beat
play tone High C for 1/2 beat
play tone High C for 1 beat
play tone High G for 1 beat
play tone High F for 1 beat
play tone High E for 1/2 beat
play tone High E for 1 beat
play tone High C for 1 beat
play tone High B for 1 beat
play tone High A for 1/2 beat
play tone High A for 1 beat
play tone High F for 1/2 beat
play tone High D for 1/2 beat
play tone High C for 1/2 beat
play tone Middle B for 1/2 beat
play tone High D for 1/2 beat
play tone Middle B for 1/2 beat
play tone Middle A for 1/2 beat
play tone Middle G for 1/2 beat
play tone Middle A for 1/2 beat



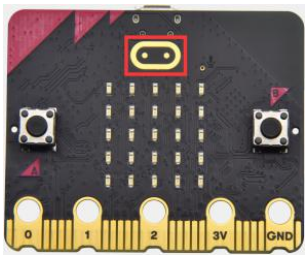
The music note is shown below:



More resource: https://en.wikipedia.org/wiki/Numbered_musical_notation

Download code to micro:bit V2 and plug in power with USB cable, as a result, micro:bit V2 emits song "Ode to Joy".

Project 10: Touch Sensitive Logo



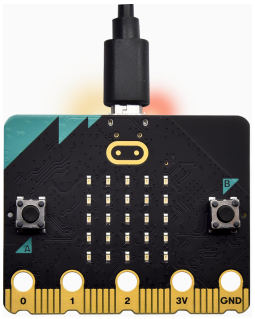
1. Description:

Micro:bit V2 has a touch sensitive logo as a input. It is fundamentally a capacitive touch sensor which can sense the tiny changes in the current.

2. Components:

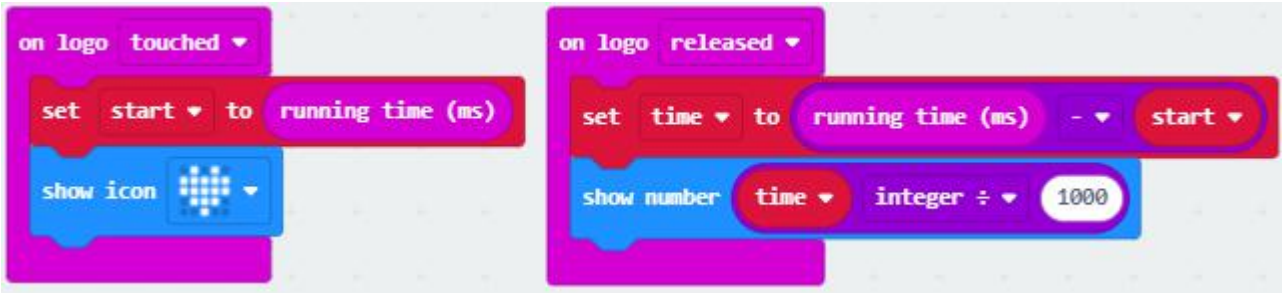
- Micro:bit V2 *1
- Micro USB Cable*1

3.Wiring Up:



Interface micro:bit V2 with your computer using micro USB cable

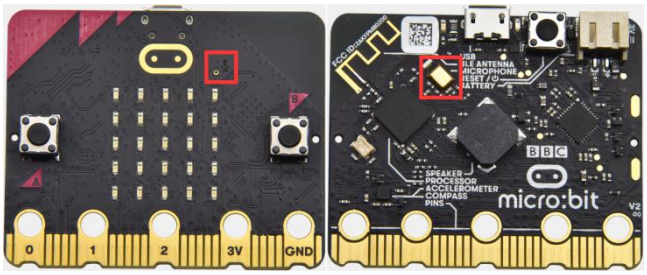
4.Test Code and Result:



Download code to micro:bit V2 and keep USB cable connected.

Micro:bit V2 will show "❤" if you touch logo  , on the contrary, the number will be shown if the log  is not touched.

Project 11: Microphone



1.Description:

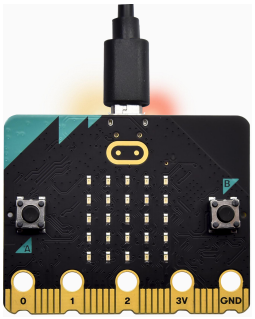
The micro:bit V2 has a built-in microphone which can detect the sound intensity. Additionally, there is a microphone LED indicator at the back.

Its indicator will turn on if you clap your hands; therefore, we can make an analog noise detection watch.

2. Components:

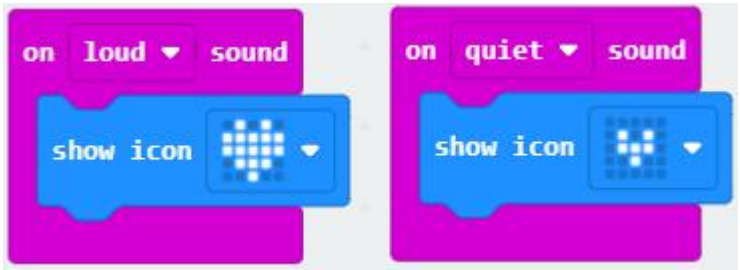
- Micro:bit V2 *1
- Micro USB Cable*1

3.Wiring Up:



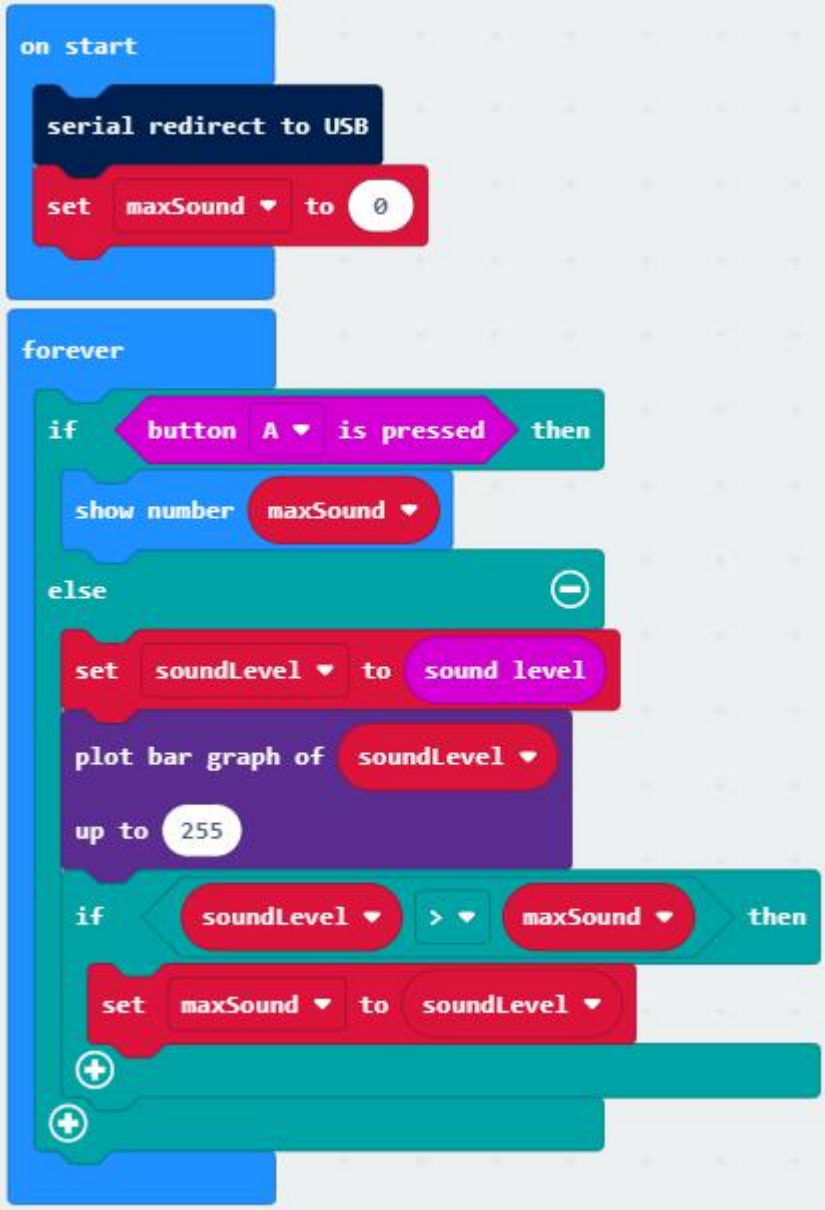
Interface micro:bit V2 with your computer using micro USB cable.

4.Test Code and Results 1:



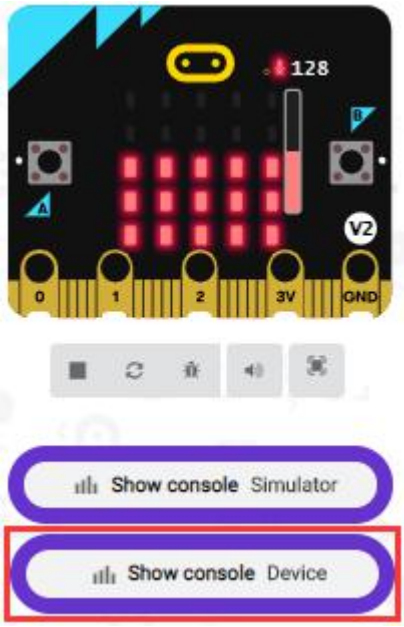
Download code to micro:bit V2, and keep micro USB connected. Pattern "❤" will be displayed when you clap your hands; however, pattern "" will appear when in the quit environment.

5.Test Code and Results 2:

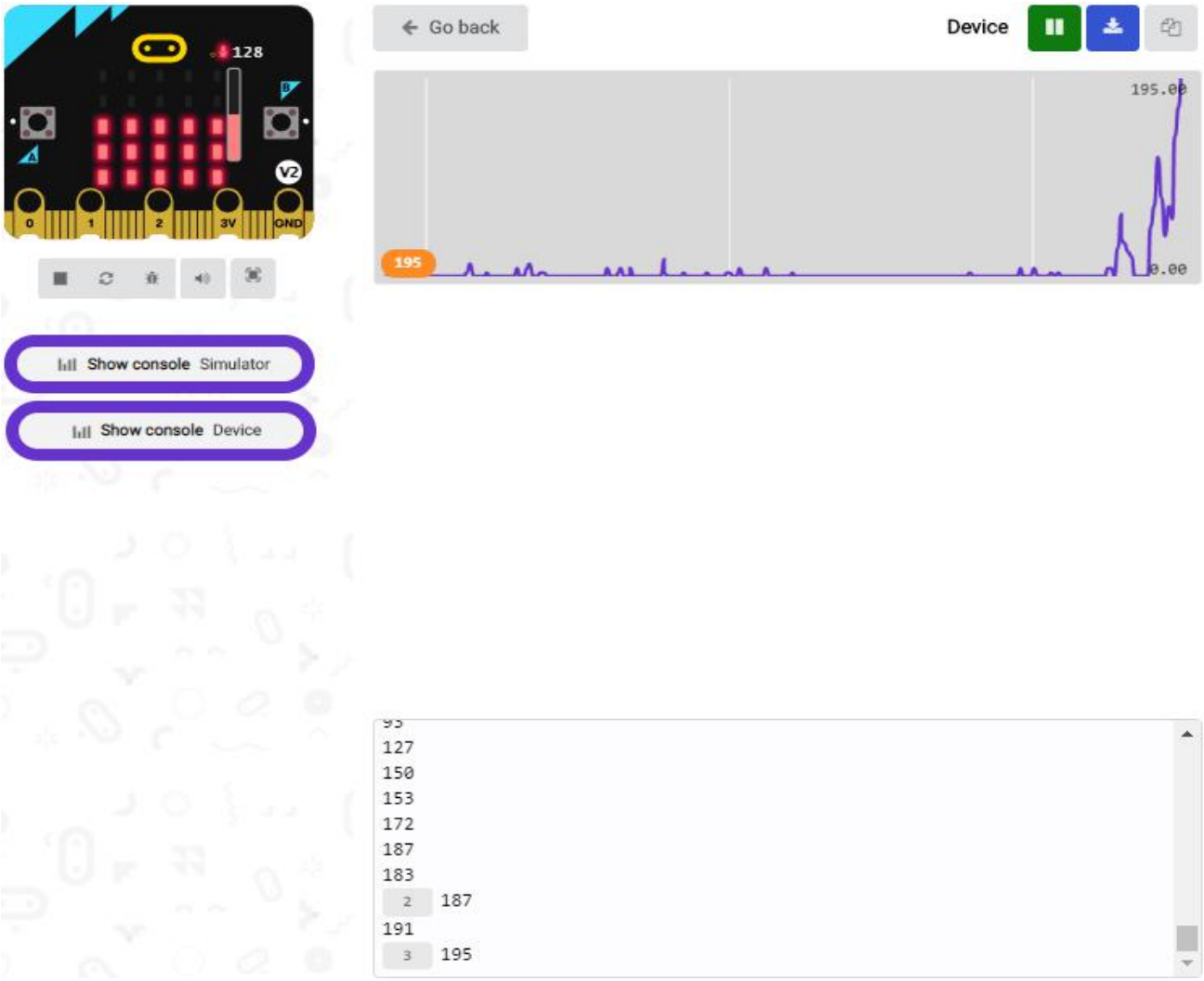


Download code to micro:bit V2 and keep micro USB cable connected. Click

"Show console device" .

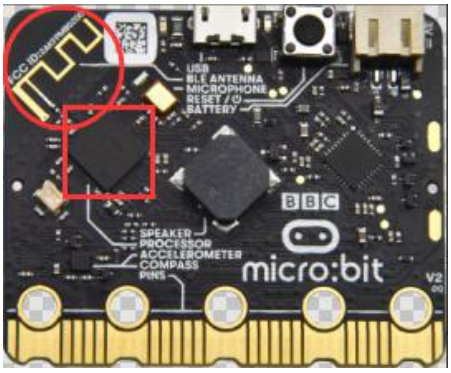


The output sound value increases when the sound amplifies, as shown below;



Micro:bit V2 will show the maximum value of sound intensity(Note: set the maximum value via reset button), when button A is pressed; whereas, the sound level icon will be shown when clapping.

Project 12: Bluetooth Wireless Communication



1.Project Description:

The Micro: Bit main board V2 comes with a nRF52833 processor (with built-in Bluetooth 5.1 BLE(Bluetooth Low Energy) device) and a 2.4GHz antenna for Bluetooth wireless communication and 2.4GHz wireless communication. With the help of them, the board is able to communicate with a variety of Bluetooth devices, including smart phones and tablets.

In this project, we mainly concentrate on the Bluetooth wireless communication function of this main board. Linked with Bluetooth, it can transmit code or signals. To this end, we should connect an Apple device (a phone or an iPad) to the board.

Since setting up Android phones to achieve wireless transmission is similar to that of Apple devices, no need to illustrate again.

2. Preparation

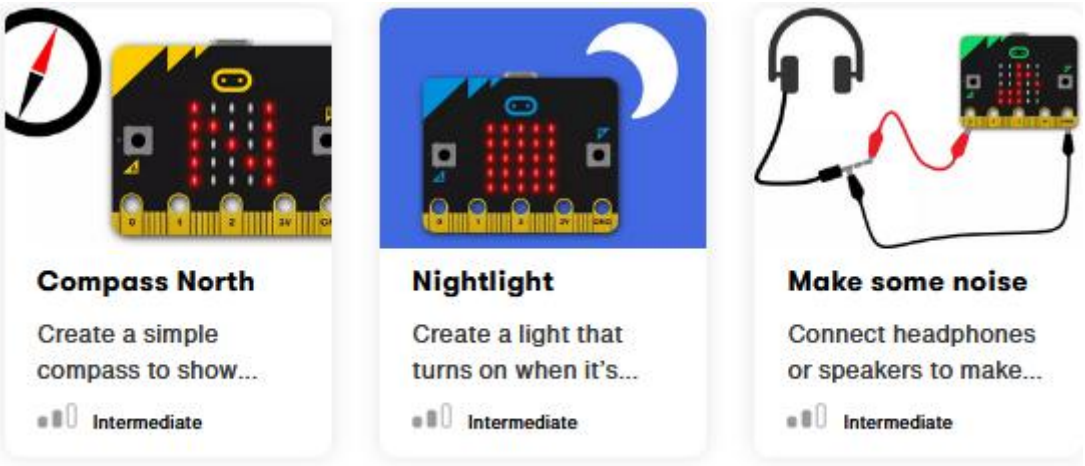
*Attach the Micro:bit main board V2 to your computer via the Micro USB

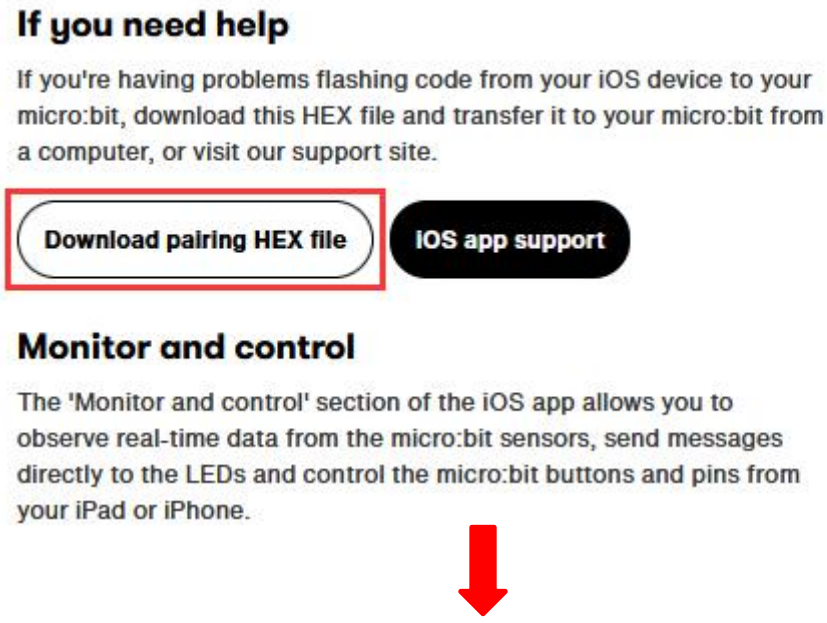
cable.

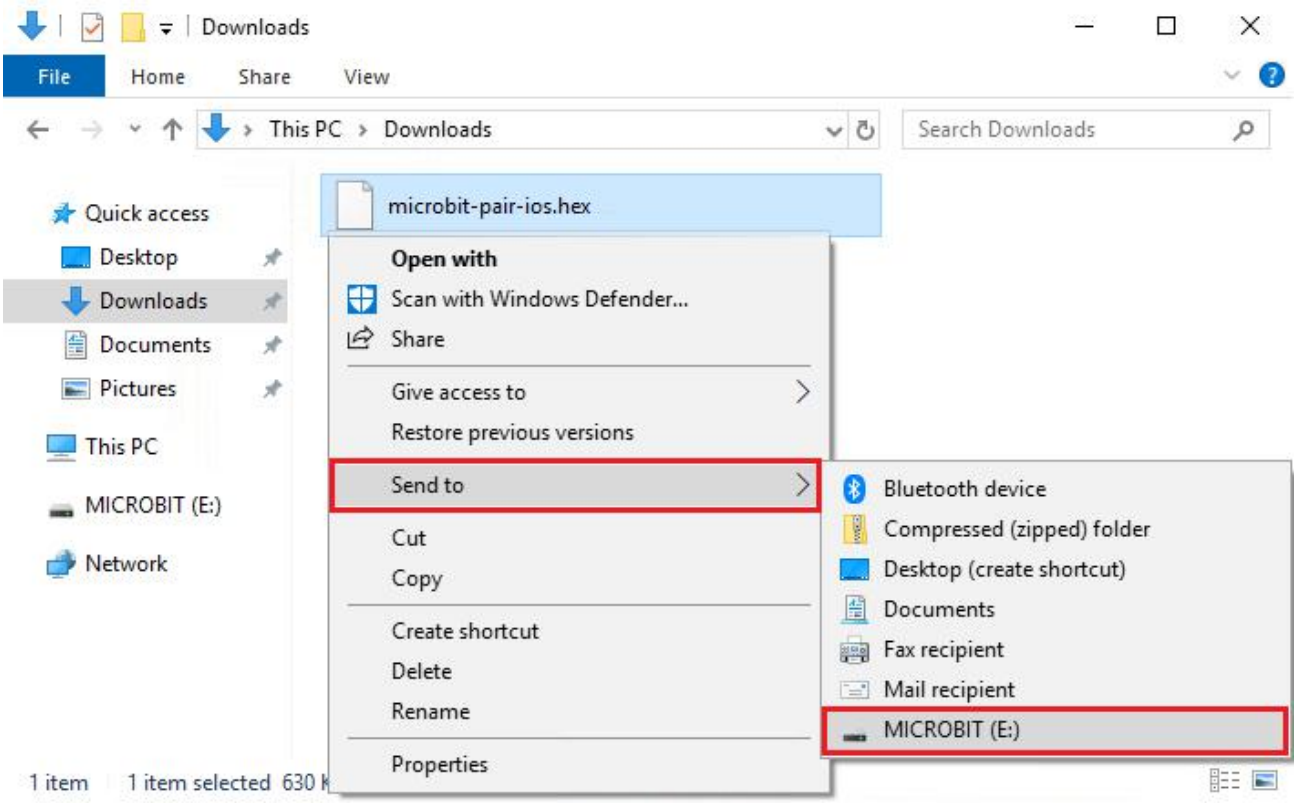
*An Apple device (a phone or an iPad) or an Android device;

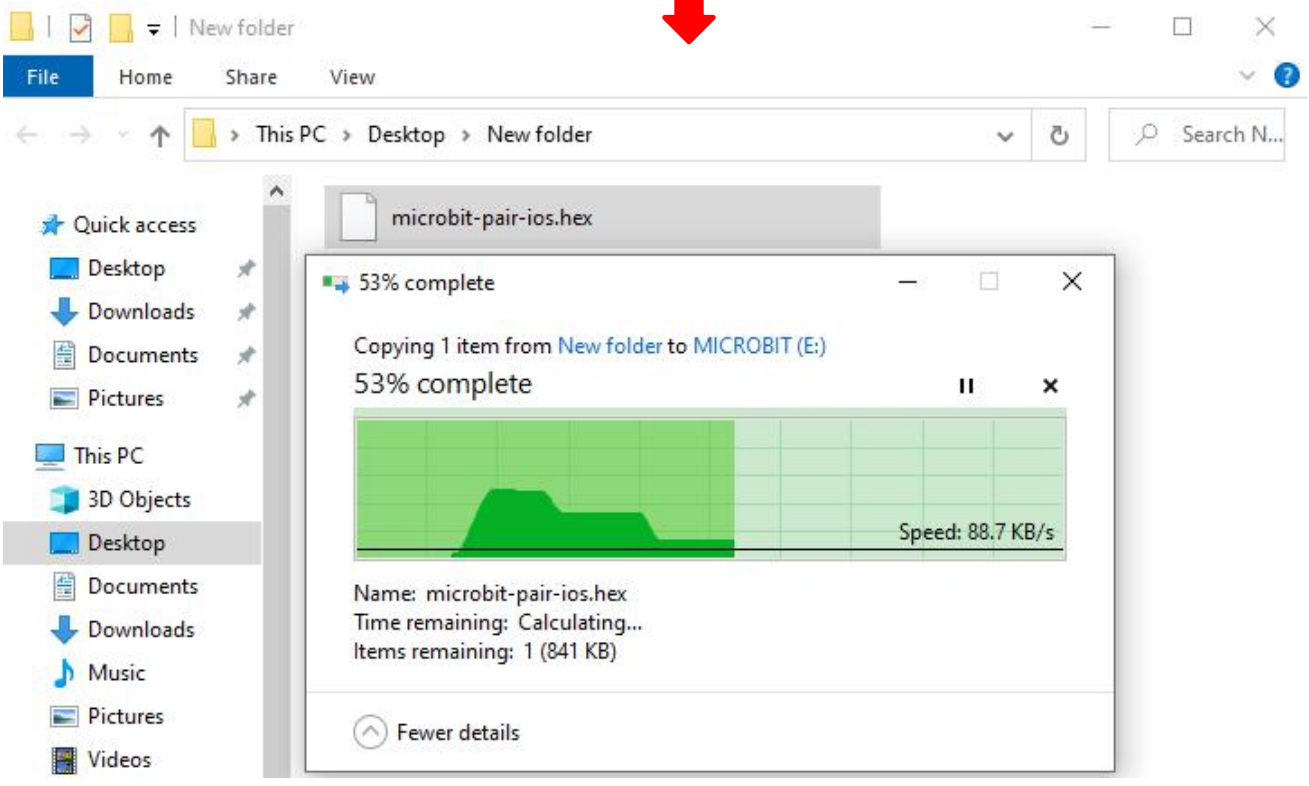
3.Procedures:

For Apple devices, enter this link https://www.microbit.org/get-started/user-guide/ble-ios/ with your computer first, and then click "Download pairing HEX file" to download the Micro: Bit firmware to a folder or desk, and upload the downloaded firmware to the Micro: Bit main board V2.

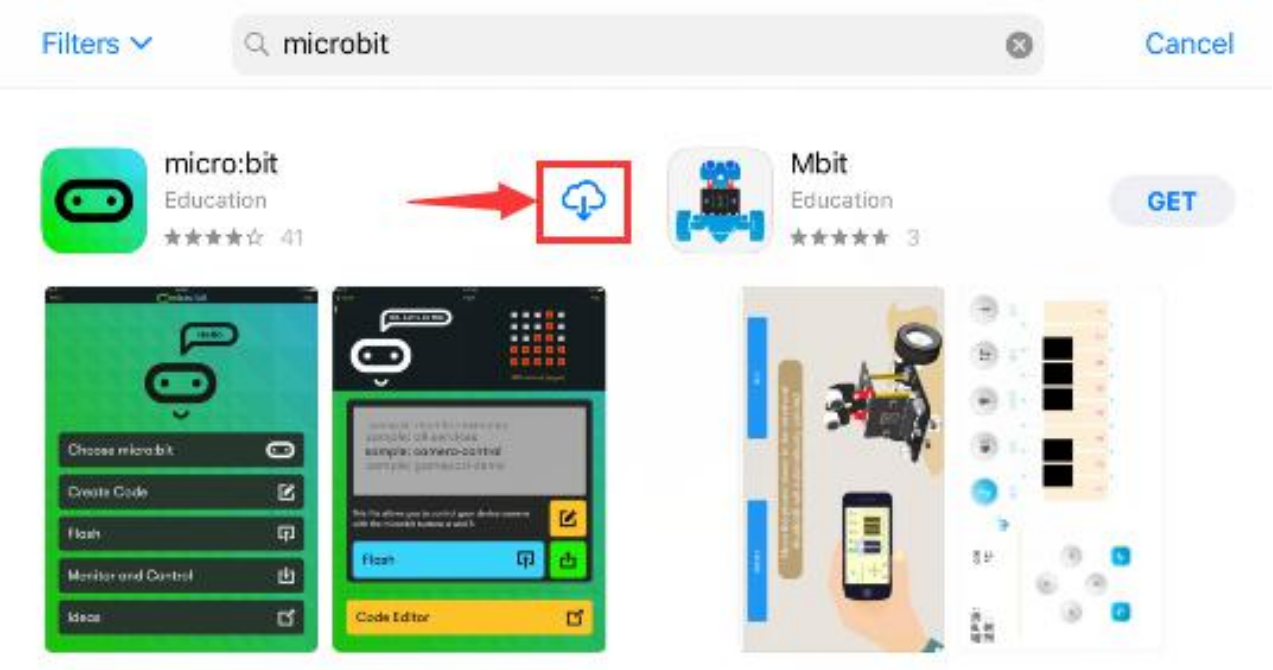





Downloads
File
Home
Share
View
This PC
Downloads
Search Downloads
Quick access
Desktop
Downloads
Documents
Pictures
This PC
MICROBIT (E:)
Network
microbit-pair-ios.hex
Open with
Scan with Windows Defender...
Share
Give access to
Restore previous versions
Send to
Cut
Copy
Create shortcut
Delete
Rename
Properties
Bluetooth device
Compressed (zipped) folder
Desktop (create shortcut)
Documents
Fax recipient
Mail recipient
MICROBIT (E:)
1 item
1 item selected 630 K


New folder
File
Home
Share
View
This PC
Desktop
New folder
Search N...
Quick access
Desktop
Downloads
Documents
Pictures
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
microbit-pair-ios.hex
53% complete
Copying 1 item from New folder to MICROBIT (E:)
53% complete
Speed: 88.7 KB/s
Name: microbit-pair-ios.hex
Time remaining: Calculating...
Items remaining: 1 (841 KB)
Fewer details

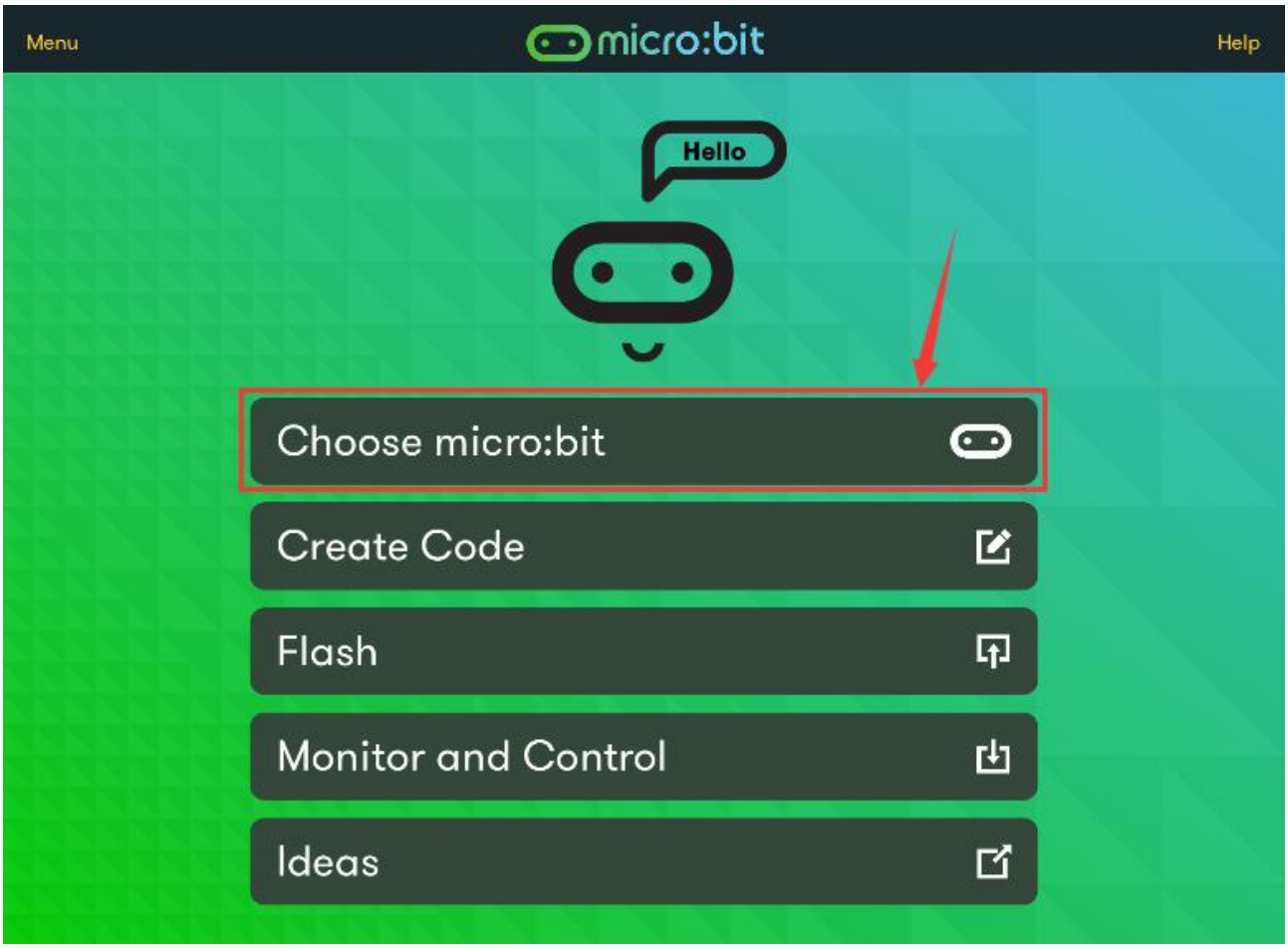
Search “micro bit” in your App Store to download the APP micro:bit.



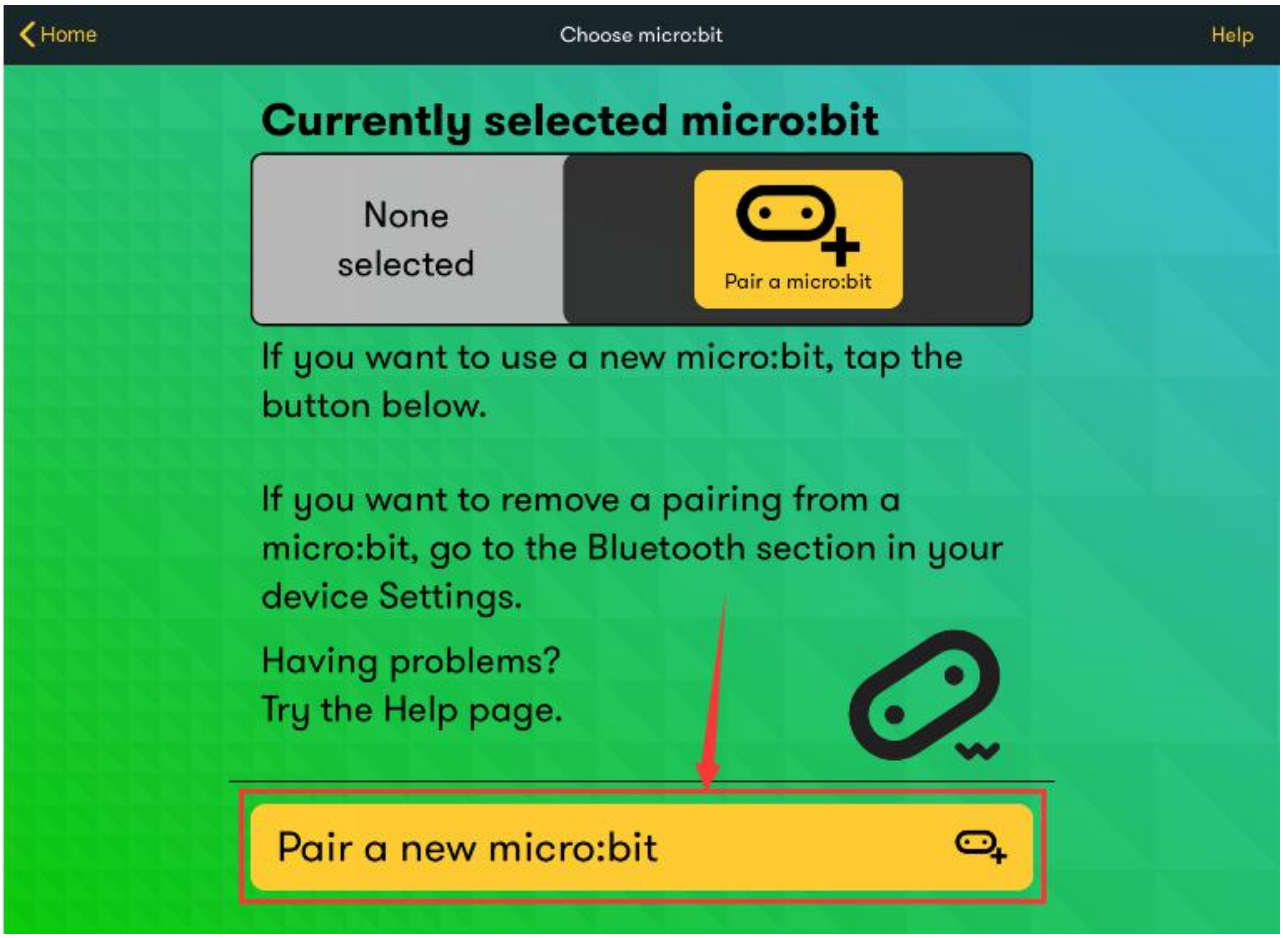
Connect your Apple device with Micro: Bit main board V2:

Firstly, turn on the Bluetooth of your Apple device and open the APP micro:bit to select item “Choose micro:bit” to start pairing Bluetooth.

Please make sure that the Micro: Bit main board V2 and your computer are still linked via the USB cable.

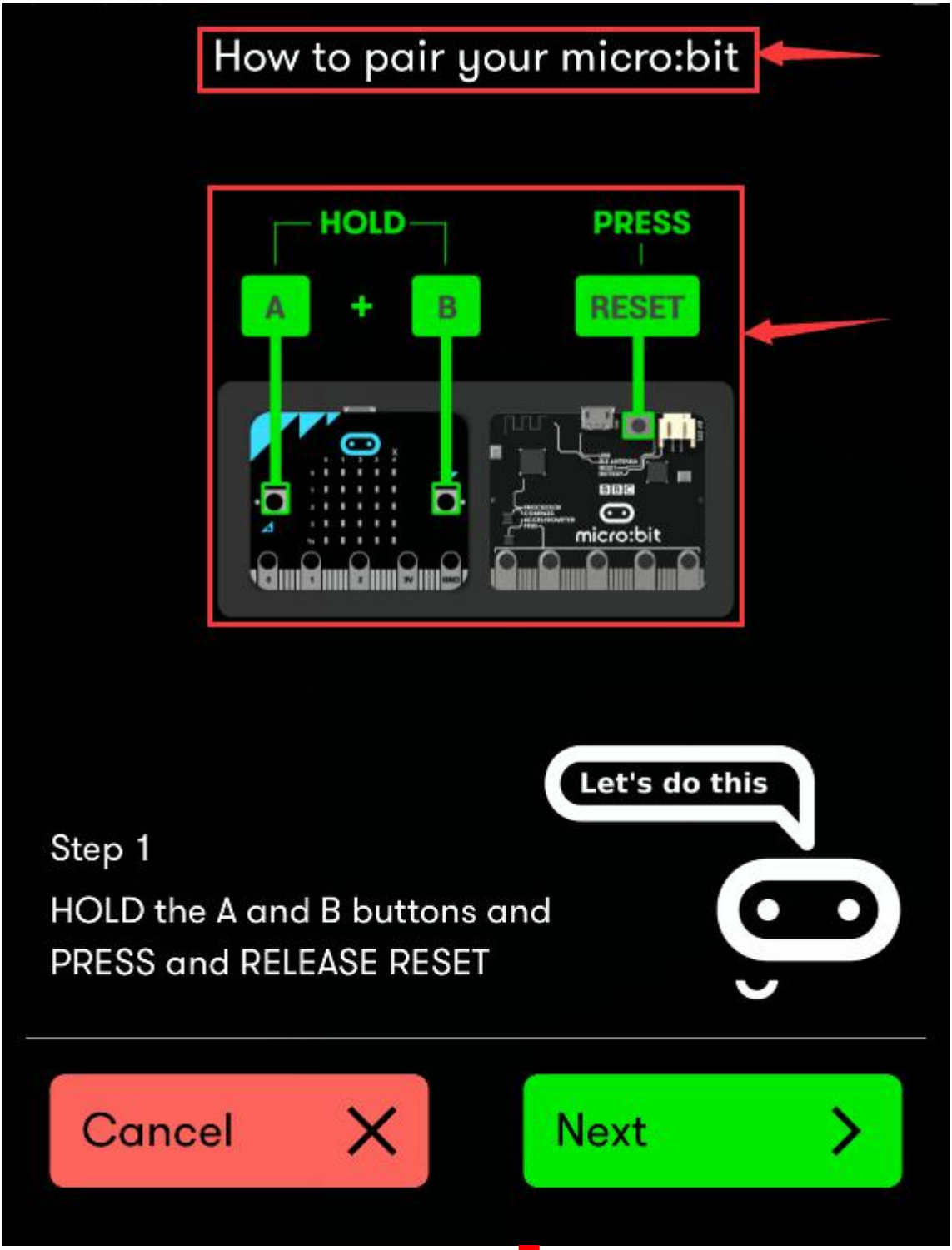


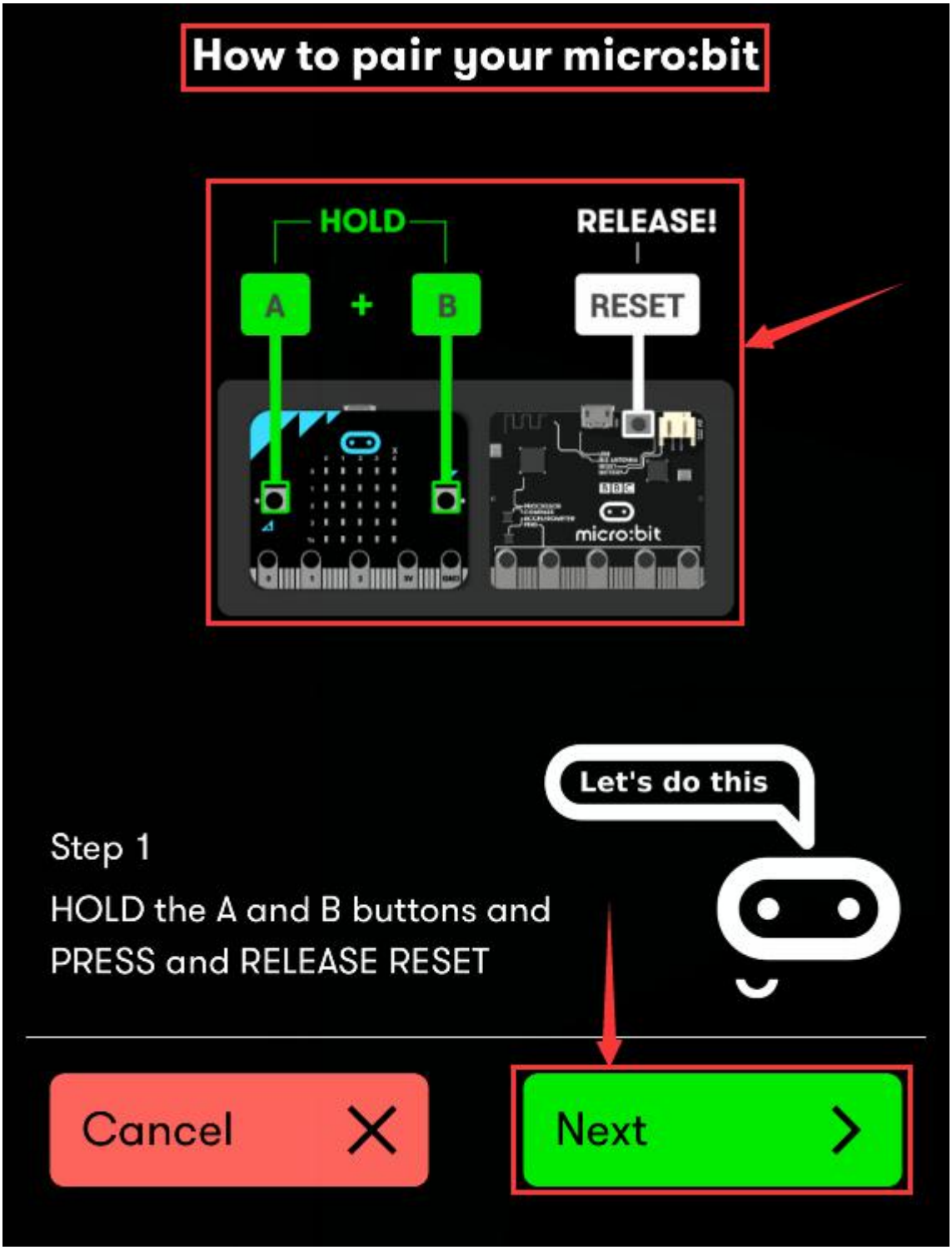
Secondly, click “Pair a new micro:bit”;



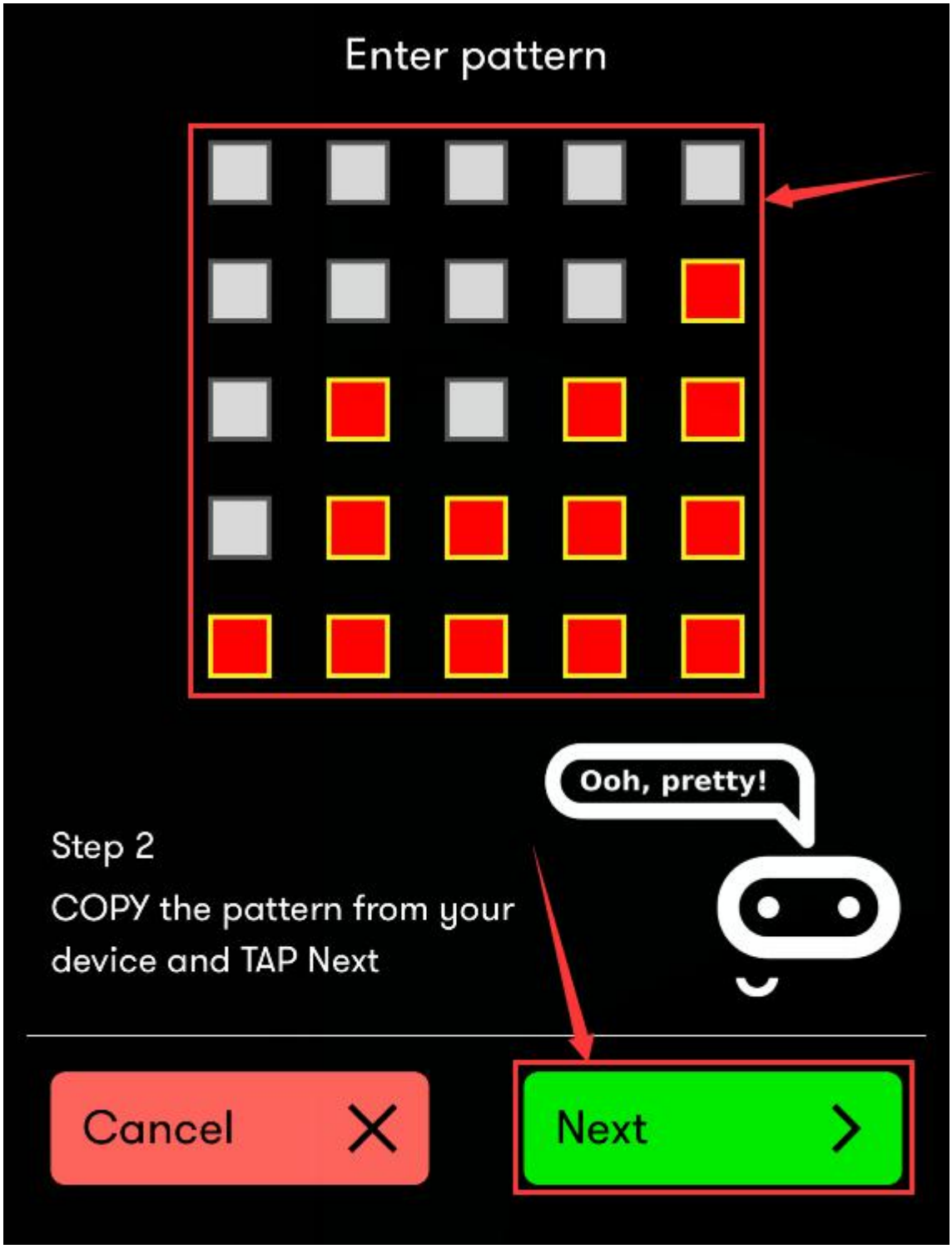
Following the instructions to press button A and B at the same time(do not release them until you are told to) and press Reset & Power button for a few seconds.

Release the Reset & Power button, you will see a password pattern shows on the LED dot matrix. Now , release buttons A and B and click Next.

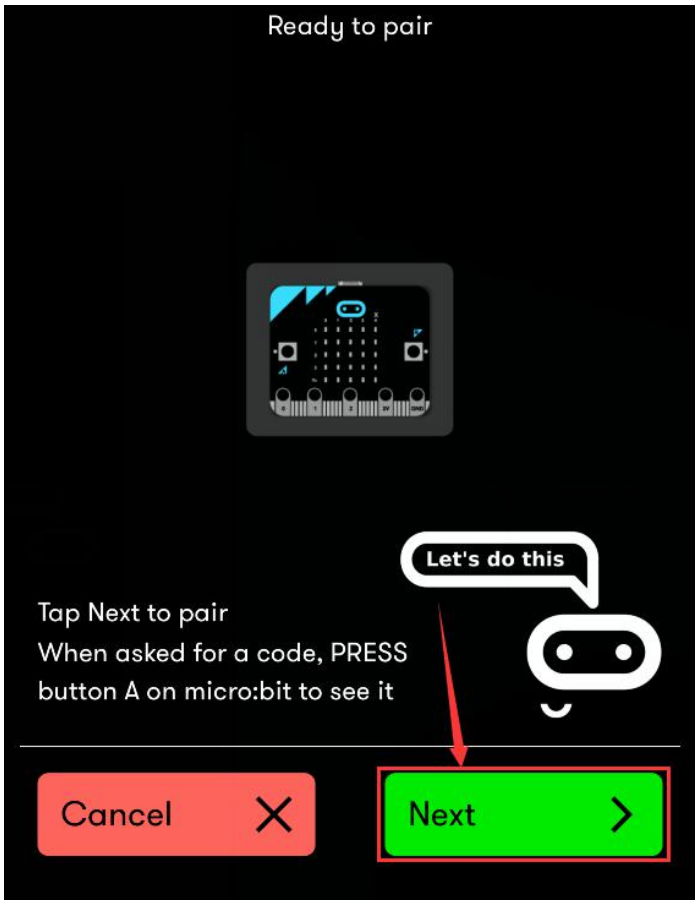

How to pair your micro:bit
HOLD
PRESS
A
+
B
RESET
micro:bit
Let's do this
Step 1
HOLD the A and B buttons and
PRESS and RELEASE RESET
Cancel
Next

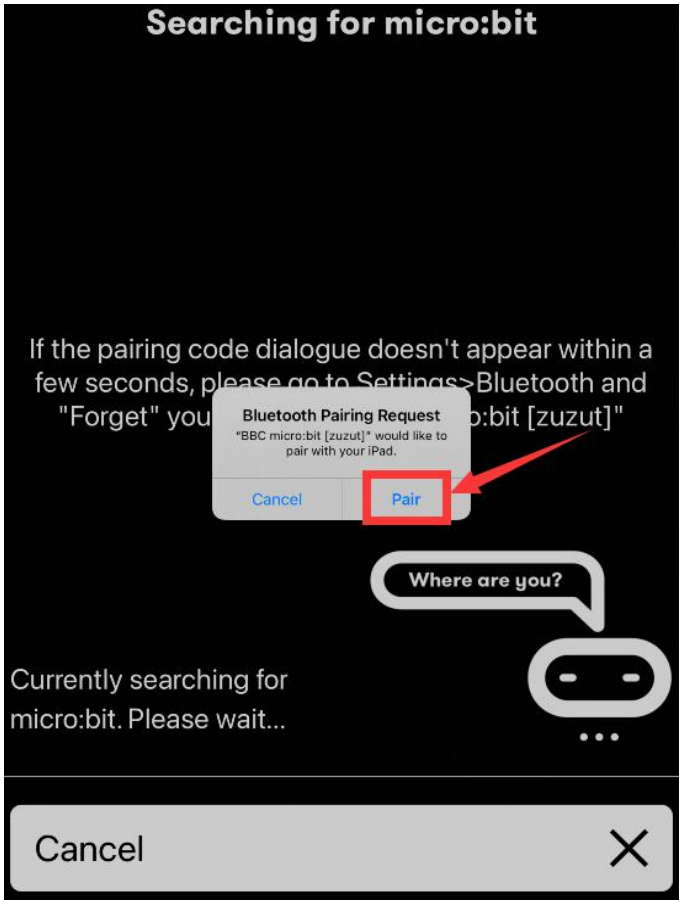

How to pair your micro:bit
HOLD
RELEASE!
A
+
B
RESET
micro:bit
Let's do this
Step 1
HOLD the A and B buttons and
PRESS and RELEASE RESET
Cancel
Next

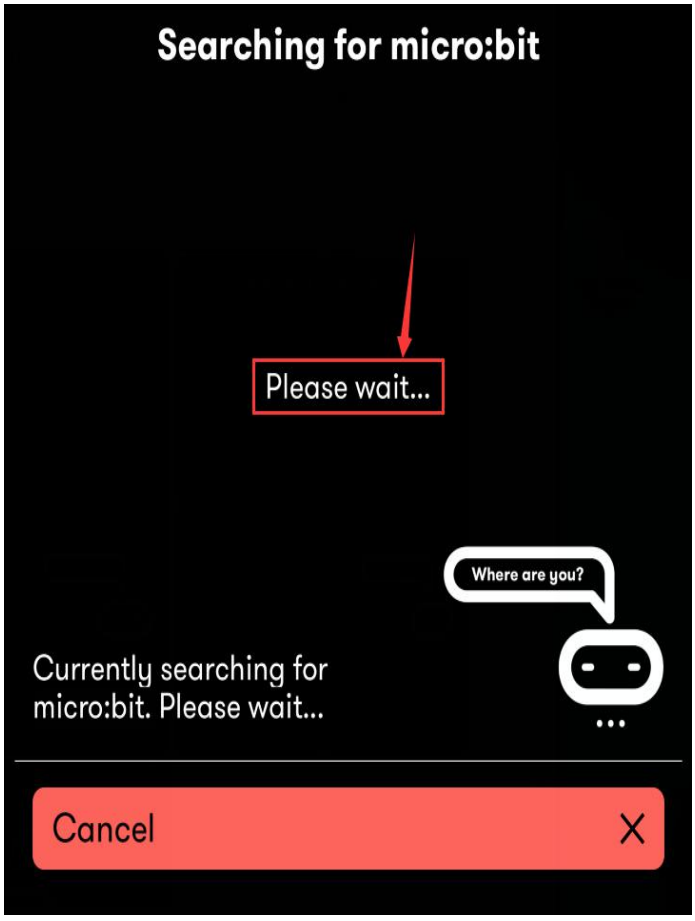
Set the password pattern on your Apple device as the same pattern showed on the matrix and click Next.



Still click Next and a dialog box props up as shown below. Then click "Pair". A few seconds later, the match is done and the LED dot matrix displays the "√" pattern.



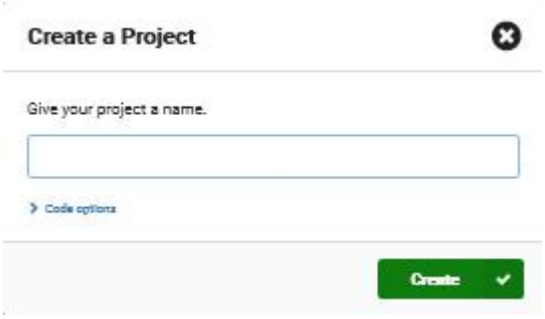

Searching for micro:bit
If the pairing code dialogue doesn't appear within a few seconds, please go to Settings>Bluetooth and "Forget" you
:bit [zuzut]"
Bluetooth Pairing Request
"BBC micro:bit [zuzut]" would like to pair with your iPad.
Cancel
Pair
Where are you?
Currently searching for micro:bit. Please wait...
Cancel


Searching for micro:bit
Please wait...
Where are you?
Currently searching for micro:bit. Please wait...
Cancel

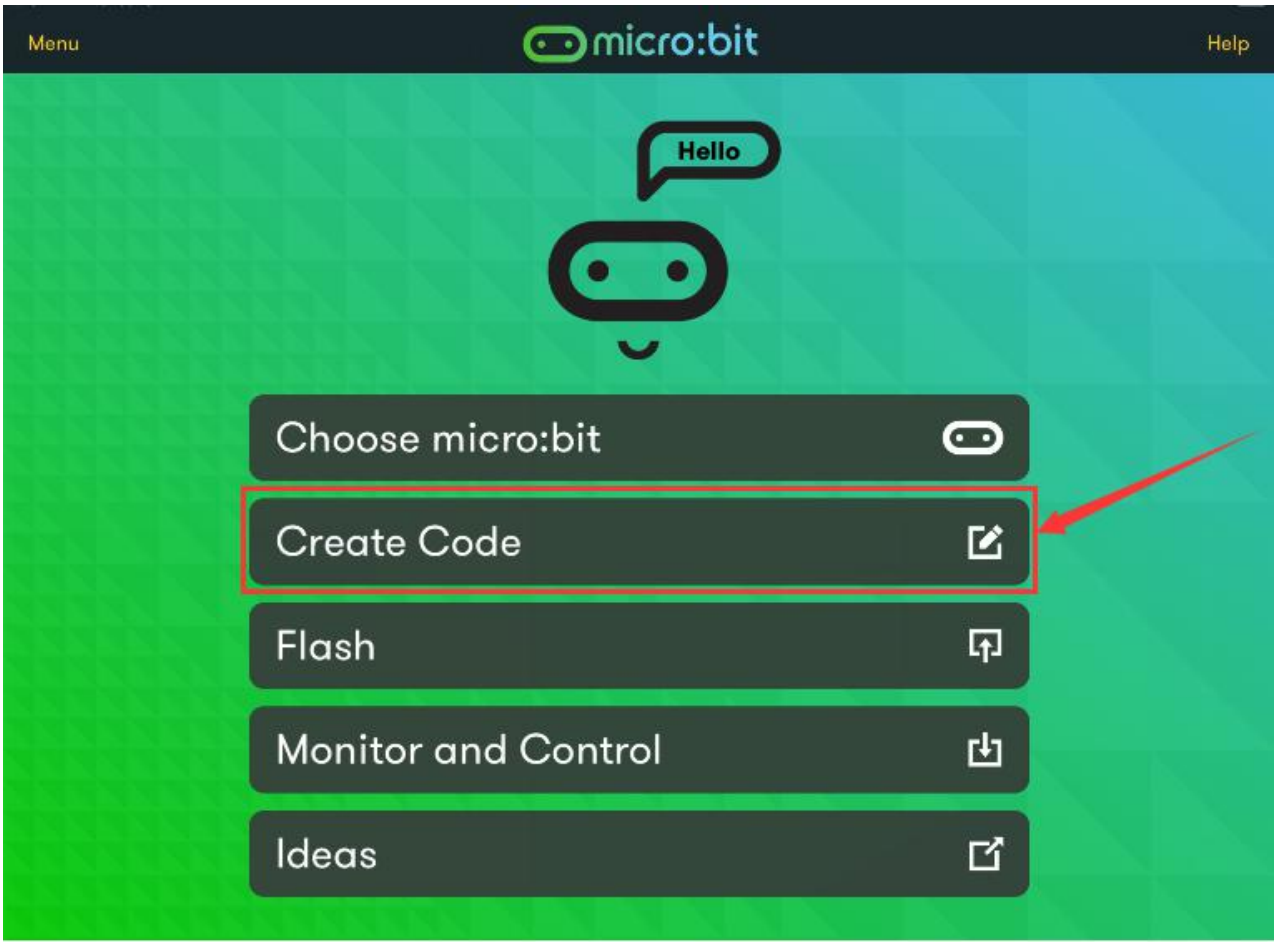
After the match with Bluetooth, write and upload code with the App.

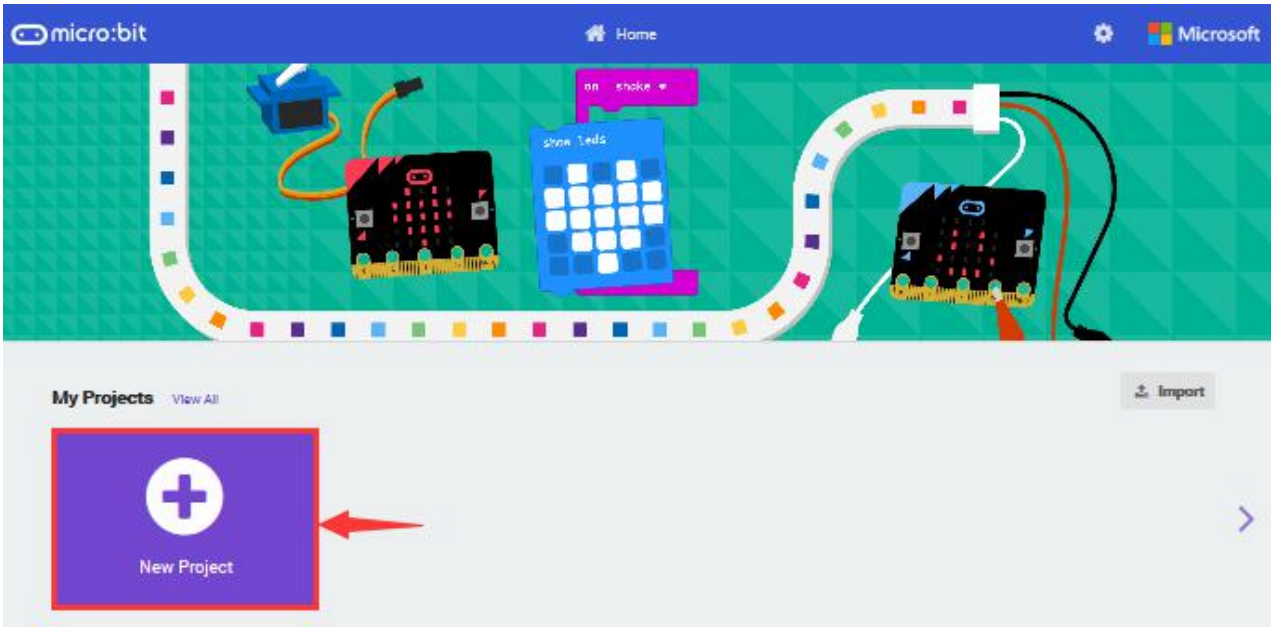
Click “Create Code” to enter the programming page and write code.

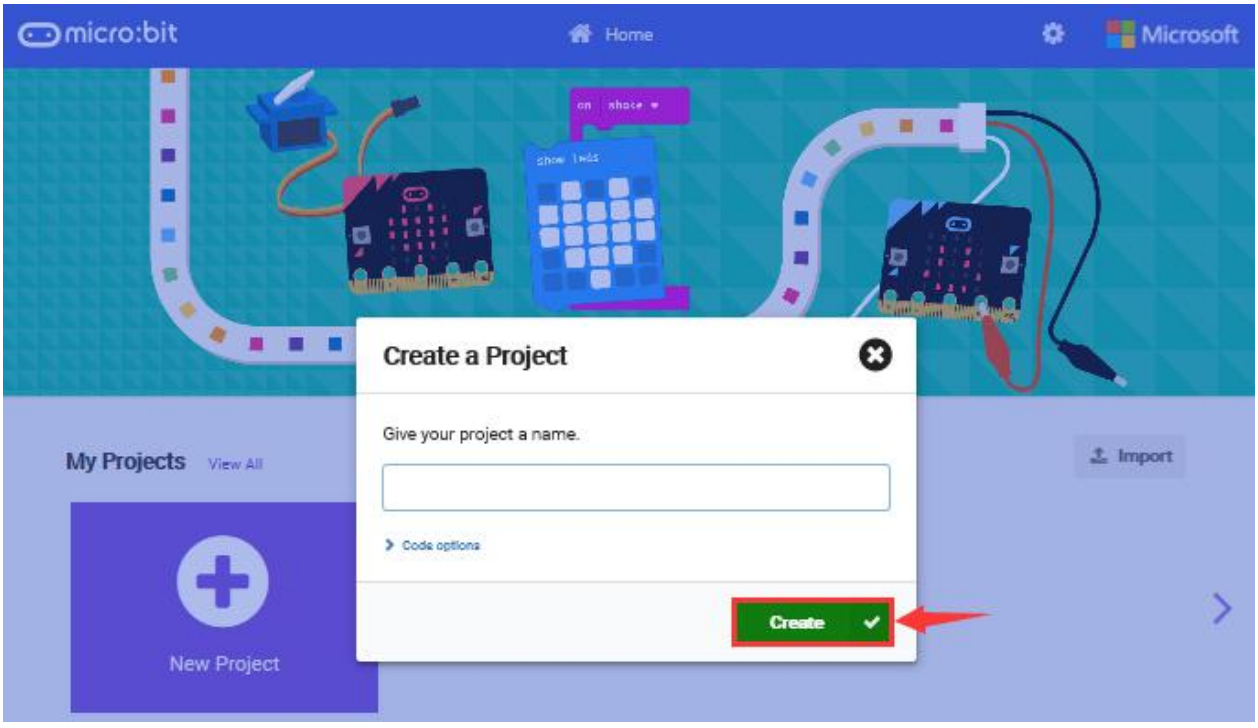
Click 

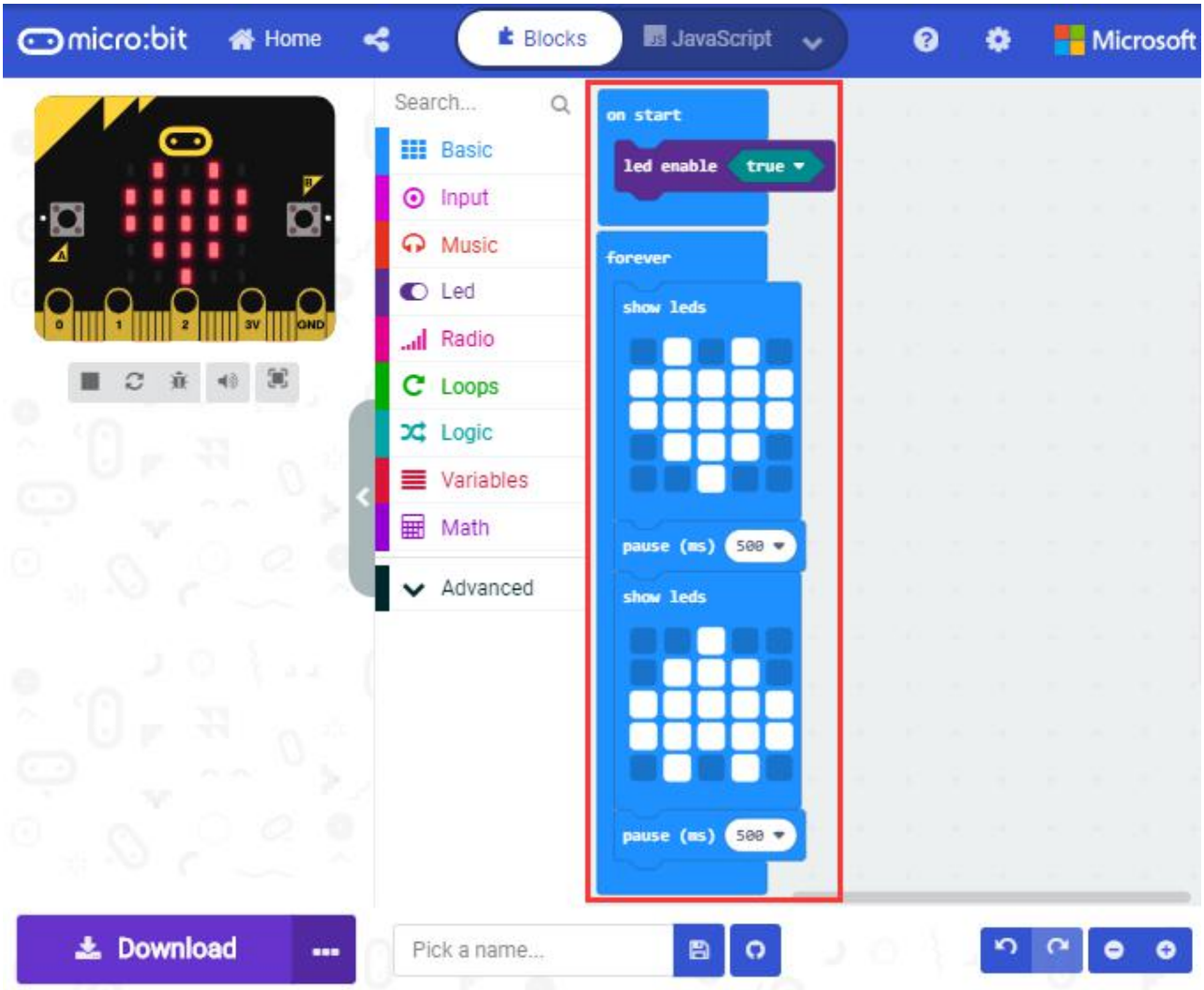
and the box 

appears, and then select “Create √”.

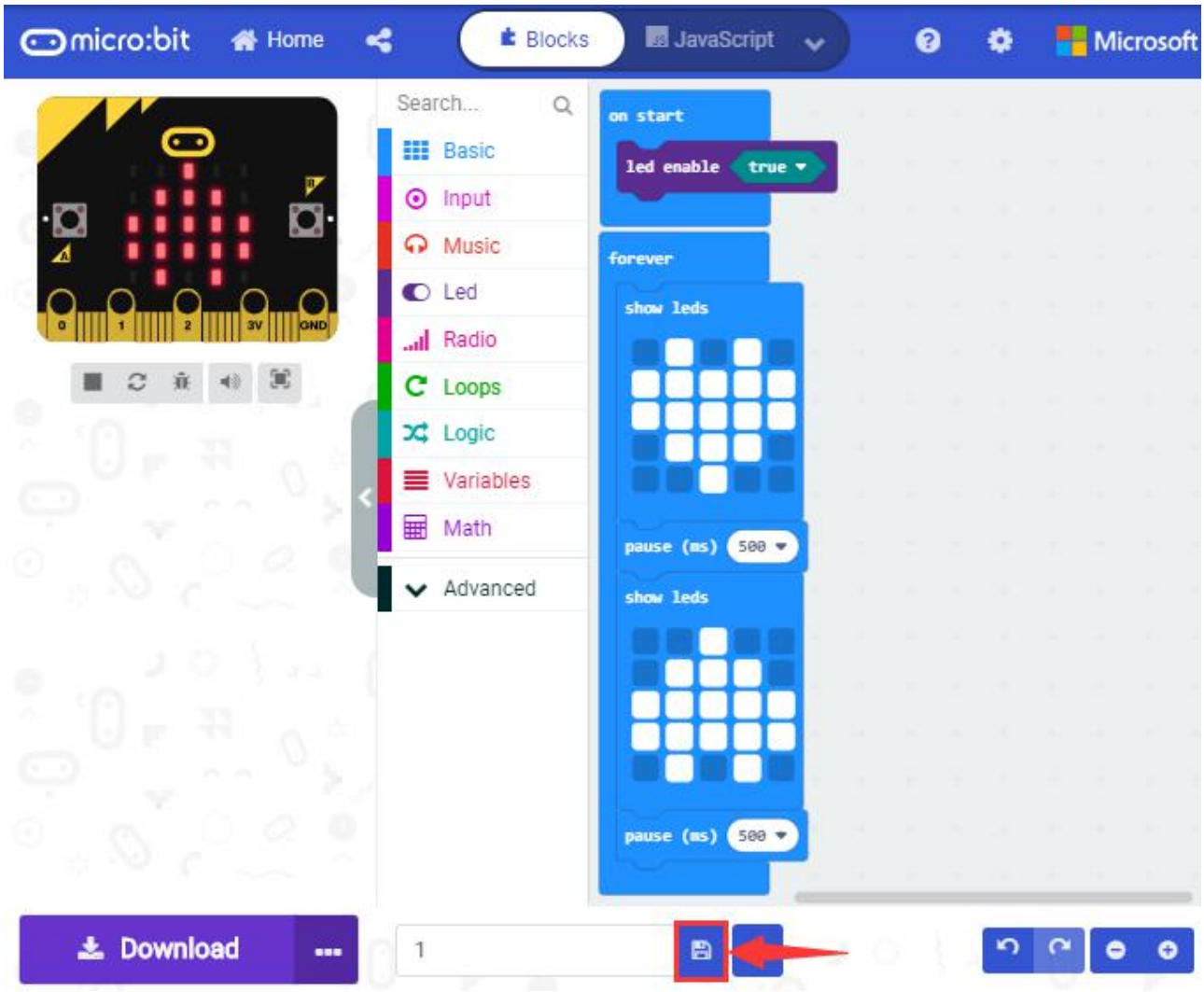

Menu
micro:bit
Help
Hello
Choose micro:bit
Create Code
Flash
Monitor and Control
Ideas


micro:bit
Home
Microsoft
My Projects
View All
Import
New Project

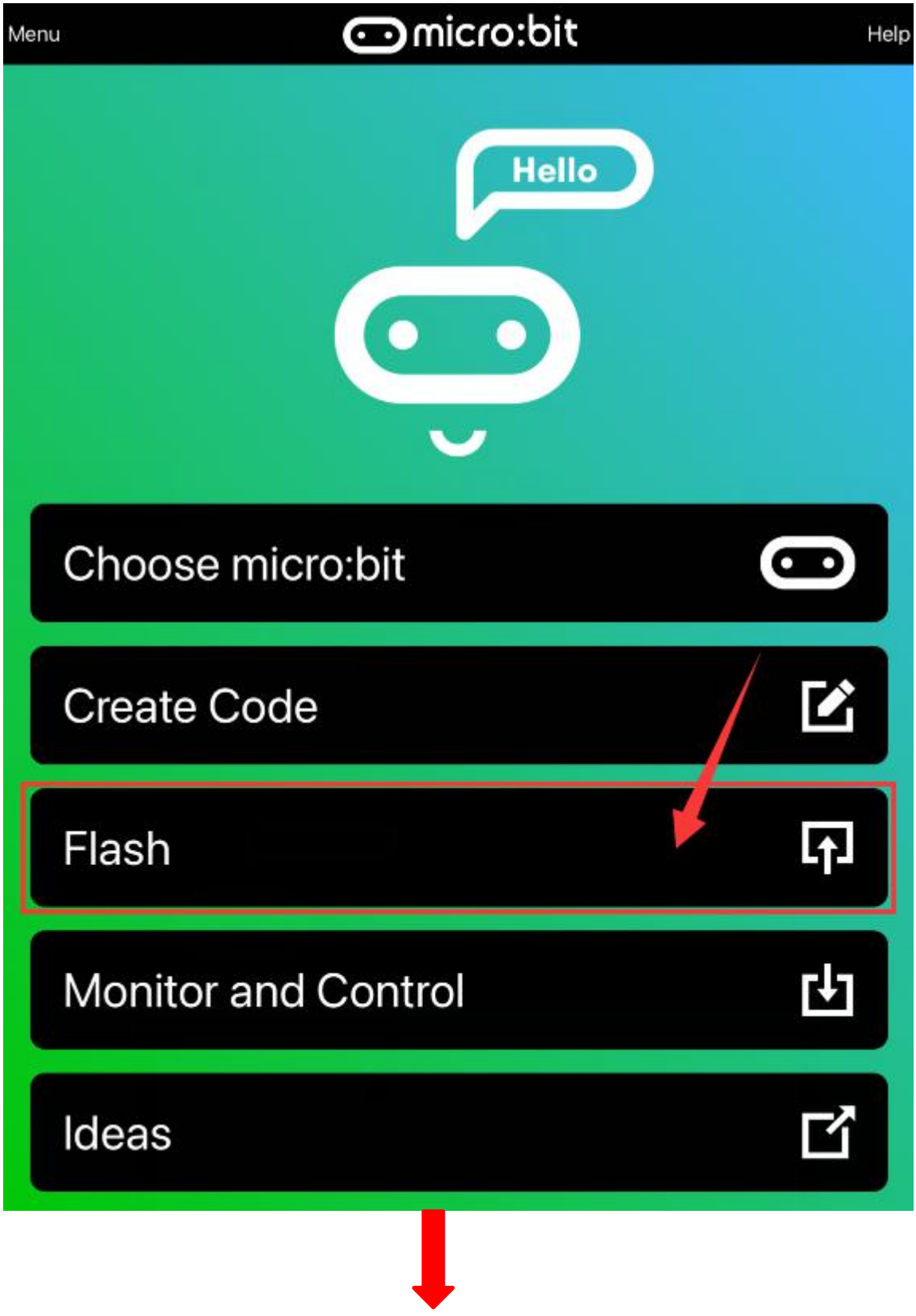

micro:bit
Home
Microsoft
Create a Project
Give your project a name.
Code options
Create
My Projects
View All
Import
New Project

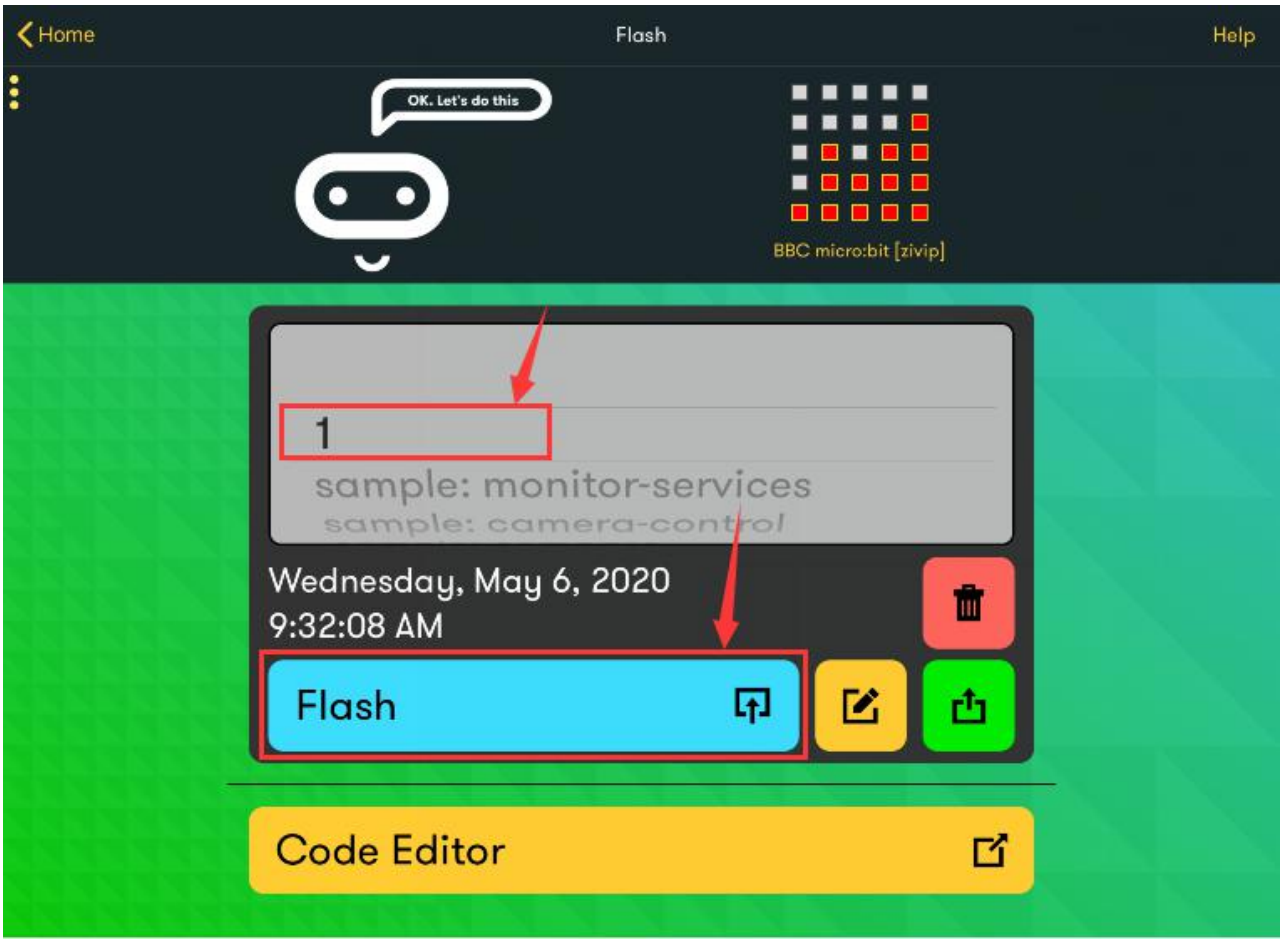


Name the code as “1 “and click  to save it.

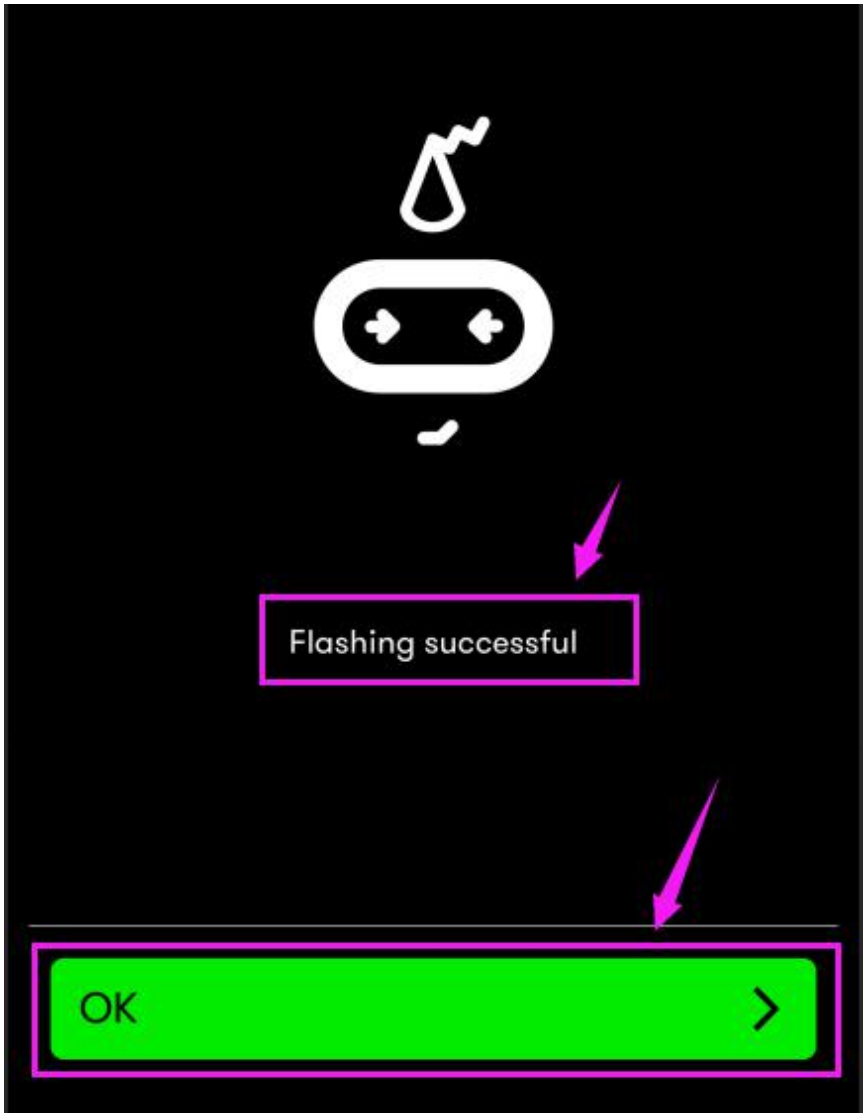


Click the third item “Flash” to enter the uploading page. The default code program for uploading is the one saved just now and named "1" and then click the other "Flash" to upload the code program "1".


Menu
micro:bit
Help
Hello
Choose micro:bit
Create Code
Flash
Monitor and Control
Ideas


Home
Flash
Help
OK. Let's do this
BBC micro:bit [zivip]
1
sample: monitor-services
sample: camera-control
Wednesday, May 6, 2020
9:32:08 AM
Flash
Code Editor

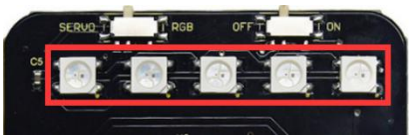
If the code is uploaded successfully a few seconds later, the App will emerge as below and the LED dot matrix of the Micro: Bit main board V2 will exhibit a heart pattern.



Projects below all conduct with the built-in sensors and the LED dot matrix while the following ones will carry out with the help of external sensors.

（Attention：to avoid burning the the Micro:bit main board V2, please remove the USB cable and the external power from the board before fix it with a T-shaped shield; likewise, the USB cable and the external power should be cut from the main board before disconnect the shield from the board.)

Project 13: SK6812-P4 RGB



1. Description:

The control board comes with five SK6812-P4 RGB lights controlled by micro:bit V2. In this lesson, we will make five SK6812-P4 RGB lights display three effects.

Note: the servo of car’ s arm is interfaced with P0. You can control it via DIP switch

Control board:
https://wiki.keyestudio.com/KS0493_Keyestudio_Micro_bit_Shield_For_Mini_Servo_Car

Preparation:

(1) A desk bit car

(2) Place batteries into battery holder.

(3) Dial the DIP switch of mini servo car to ON end and plug in power

(4) Dial the DIP switch of mini servo car to RGB end to control RGB

(5) Interface micro:bit V2 with computer using USB cable.

(6) Enter online Makecode editor

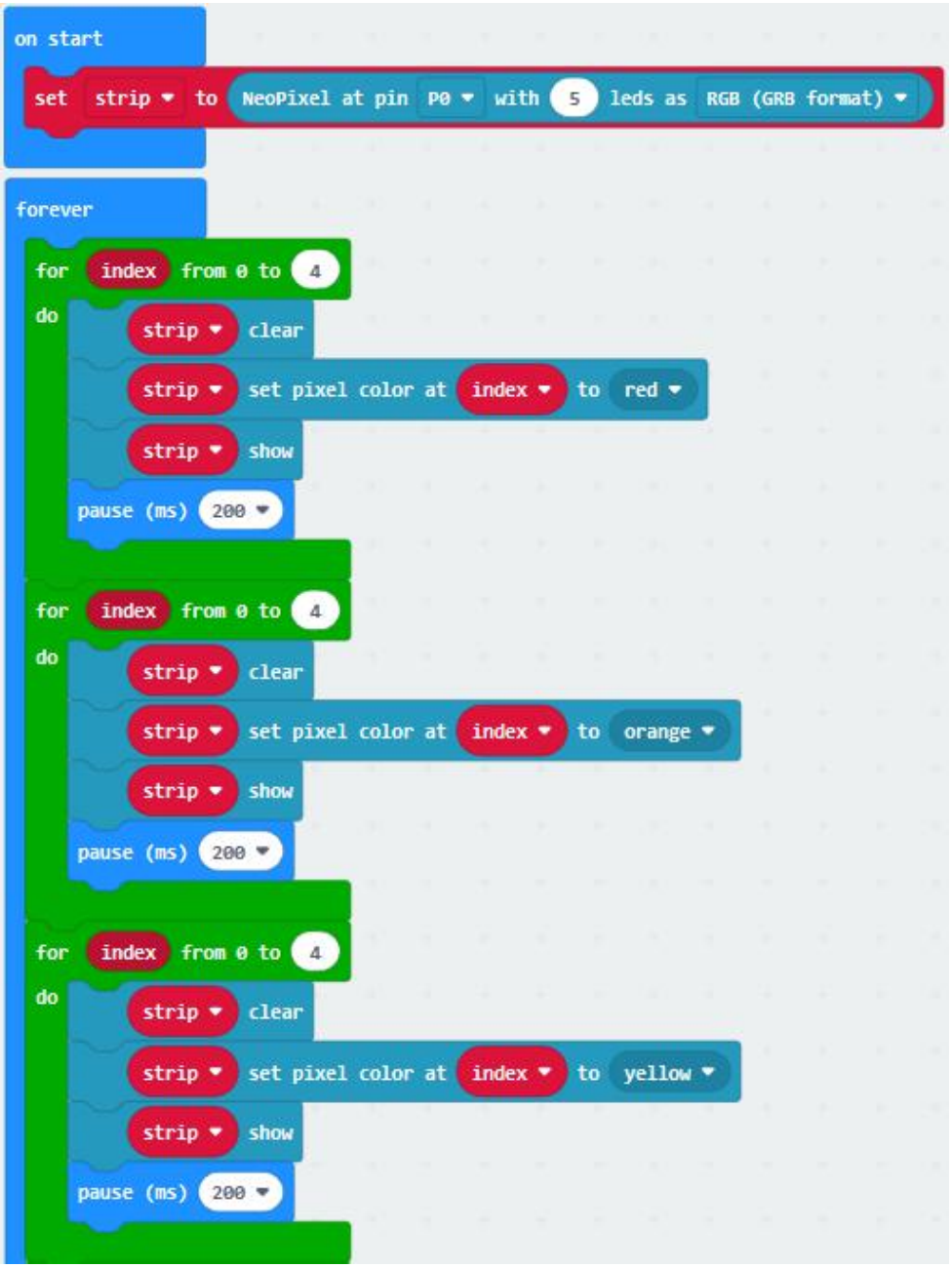
You don’ t need to add Desk Bit extension library(refer to chapter 4.6) if you choose to import Hex file.

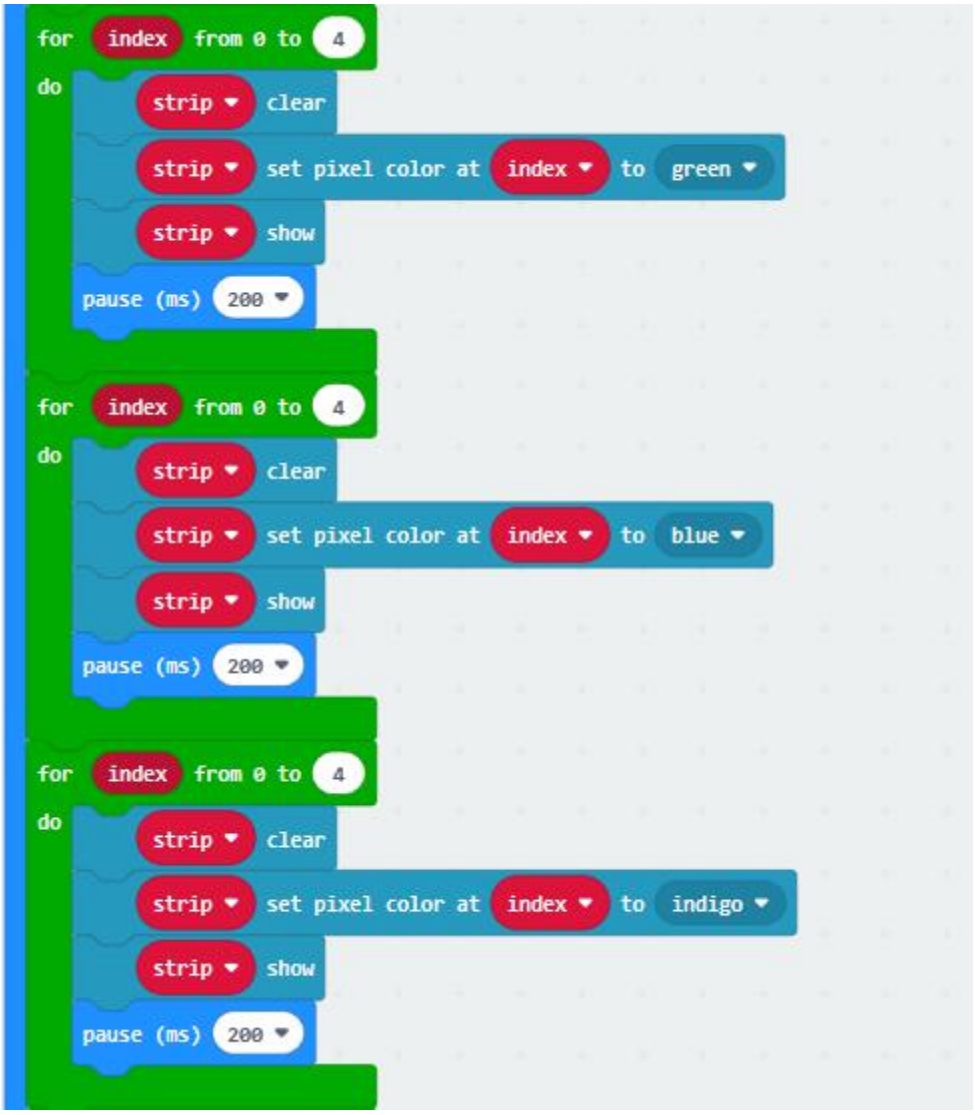
However, you need to add desk bit extension library first if you intend to edit code in the Makecode window(refer to chapter 4.4).

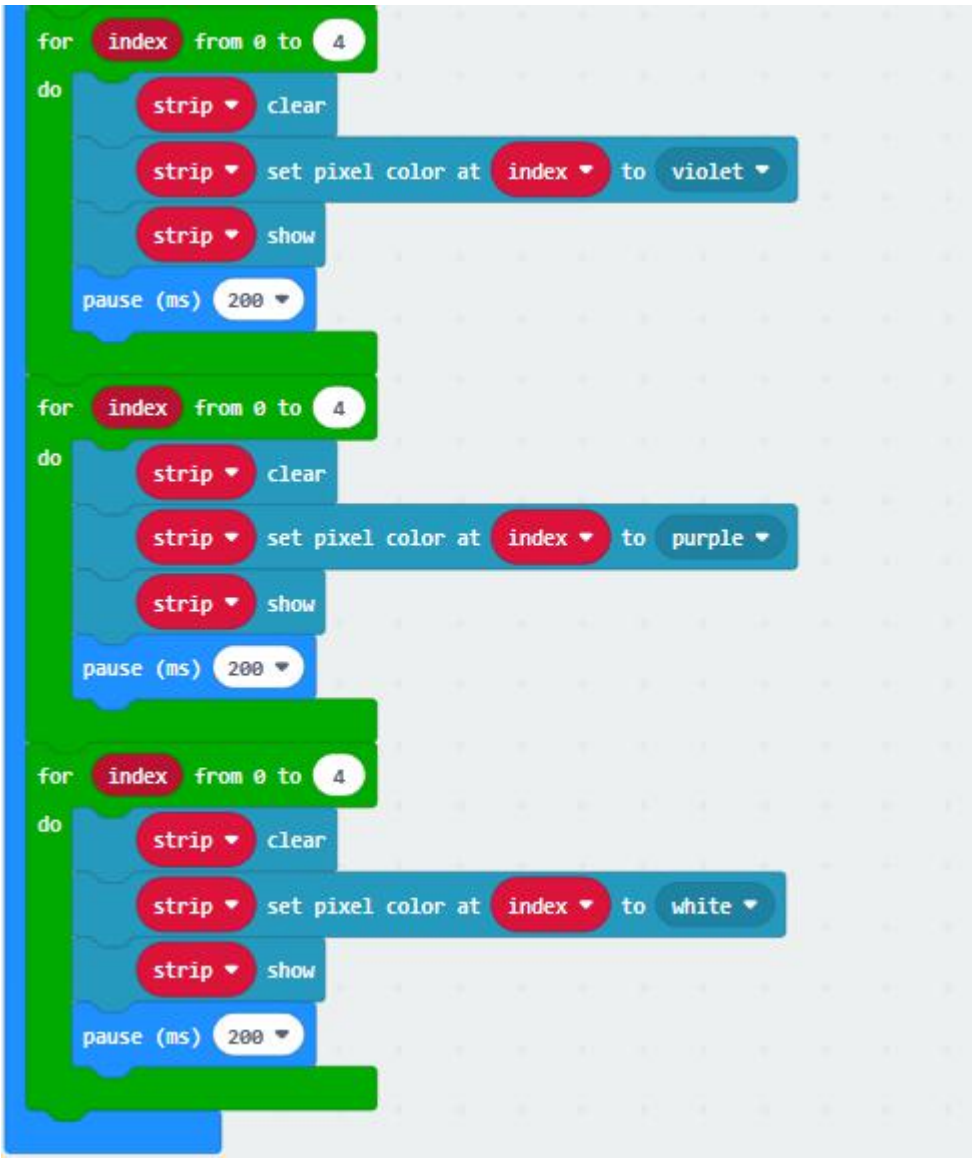
3. Test Code and Results 1:

Five pcs WS2812 RGB lights of mini servo car turn on, changing color one by one.

4.Test Code and Results 2:

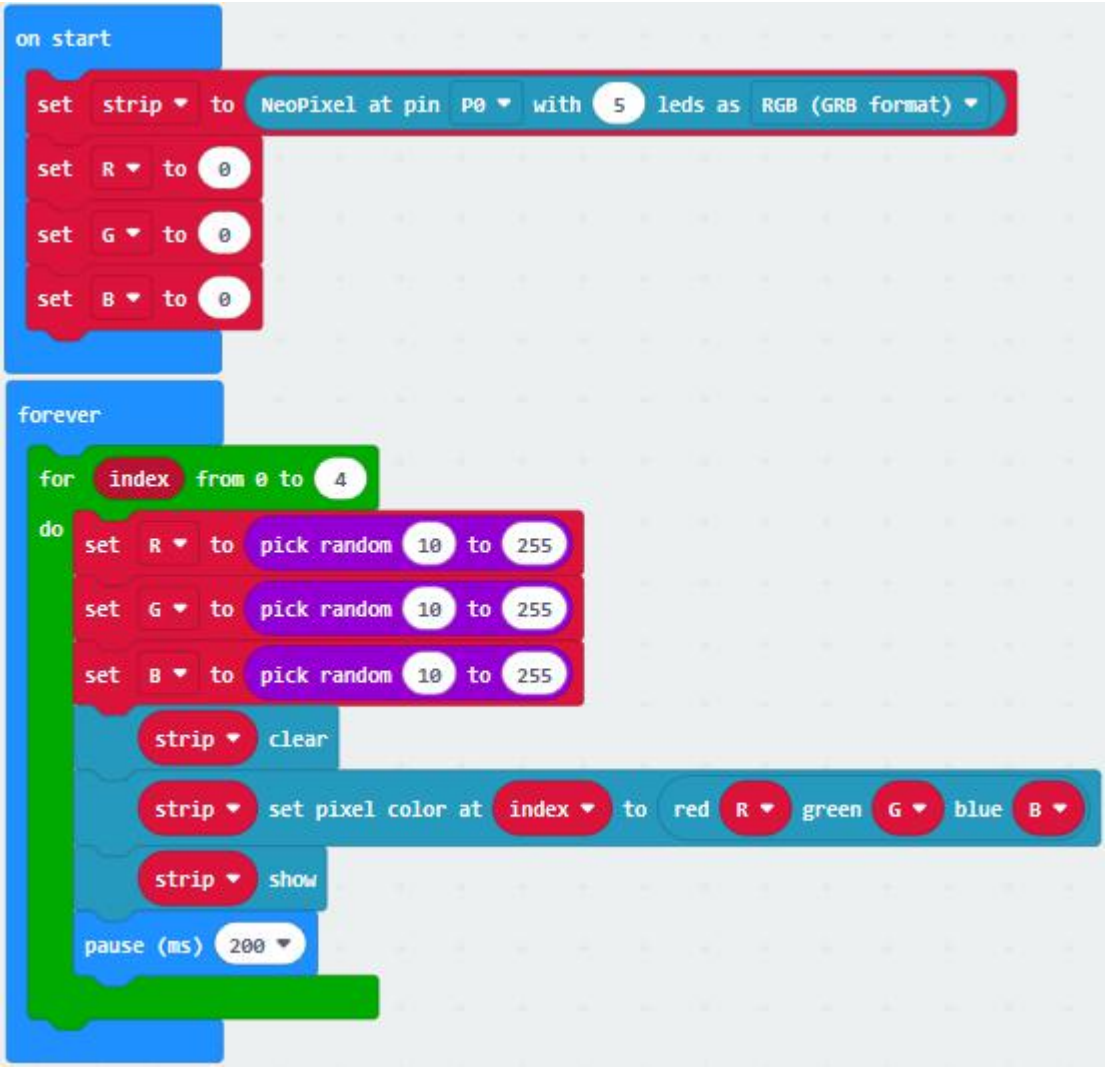

on start
set strip to NeoPixel at pin P0 with 5 leds as RGB (GRB format)
forever
for index from 0 to 4
do
strip clear
strip set pixel color at index to red
strip show
pause (ms) 200
for index from 0 to 4
do
strip clear
strip set pixel color at index to orange
strip show
pause (ms) 200
for index from 0 to 4
do
strip clear
strip set pixel color at index to yellow
strip show
pause (ms) 200


for index from 0 to 4
do
strip clear
strip set pixel color at index to green
strip show
pause (ms) 200
for index from 0 to 4
do
strip clear
strip set pixel color at index to blue
strip show
pause (ms) 200
for index from 0 to 4
do
strip clear
strip set pixel color at index to indigo
strip show
pause (ms) 200



Five WS2812RGB lights turn up, like flow light.

5.Test Code and Results 3:



5 pcs WS2812RGB of control board display random color, like flow light.

Project 14: Servo

1.Description:

The servo is applied widely, especially in robots. In this chapter, we will learn its working principle and how it works.

2. Preparation:

(1) A desk bit car

(2) Place batteries into battery holder.

(3) Dial the DIP switch of mini servo car to ON end and plug in power

(4) Dial the DIP switch of mini servo car to SERVO end to control servo.

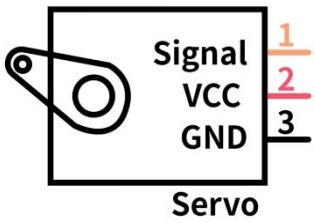
(5) Interface micro:bit V2 with computer using USB cable.

(6) Enter online Makecode editor

You don’ t need to add Desk Bit extension library(refer to chapter 4.6) if you choose to import Hex file.

However, you need to add desk bit extension library first if you intend to edit code in the Makecode window(refer to chapter 4.4).

3. Components:



Servo motor is a position control rotary actuator. It mainly consists of housing, circuit board, core-less motor, gear and position sensor. Its

working principle is that the servo receives the signal sent by MCU or receiver and produces a reference signal with a period of 20ms and width of 1.5ms, then compares the acquired DC bias voltage to the voltage of the potentiometer and obtain the voltage difference output.

In general, servo has three line in brown, red and orange. Brown wire is grounded, red one is positive pole line and orange one is signal line.

How to control 180° and 360° servo:

360° servo only controls the direction and speed instead of angles like 180° servo.

The block 

of desk bit extension library can determine 180° and 360° servos.

360° Servo:

For instance, the servo is controlled by pin P1 of micro:bit V2. The speed of servo can be set by filling number in the box behind “to”, as shown below:

0° indicates full speed along one direction,

180° implies full speed along the other direction.

90° represents static.

The right wheel rotates clockwise in full speed.

Download the following code to micro:bit V2.

Right wheel stay static

Download the following code to micro:bit v2

Right wheel rotates anticlockwise in full speed

0° means the full speed along one direction, 0°~90° implies that the

speed gradually reduces; however, 90° is staying static, 90°~180° stands for the increasing speed along the opposite direction, and 180 means full speed along the opposite direction.

180° Servo:

180° Servo is controlled by pin P0 of micro:bit V2.

The speed of servo can be set by filling number in the box behind "to", as shown below:

Download the following code to micro:bit V2.

The servo of arm rotates to 0°.

Download the following code to micro:bit.

When rotating to 90°, the arm of desk bit car is on the middle level.

The servo of arm rotates to 90°

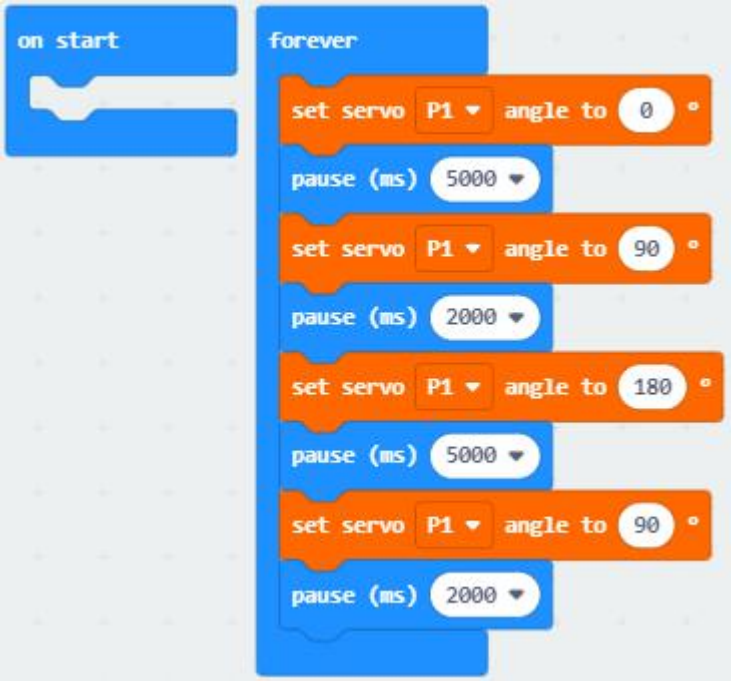
Download the following code to micro:bit.

The servo of arm rotates to 180°

4.Test Code and Results 1:

Servo of arm rotates from 0° to 45°, 90° to 135° and 180°.

5.Test Code and Results 2:



The right wheel rotates for 5s, stops for 2s, rotates anticlockwise for 5s and stops 2s.

Project 15: Desk Bit Arm

1. Description:

In previous lesson, we can make V2 board display different patterns. In this lesson, we will control the arm of desk bit car to perform a series of actions.

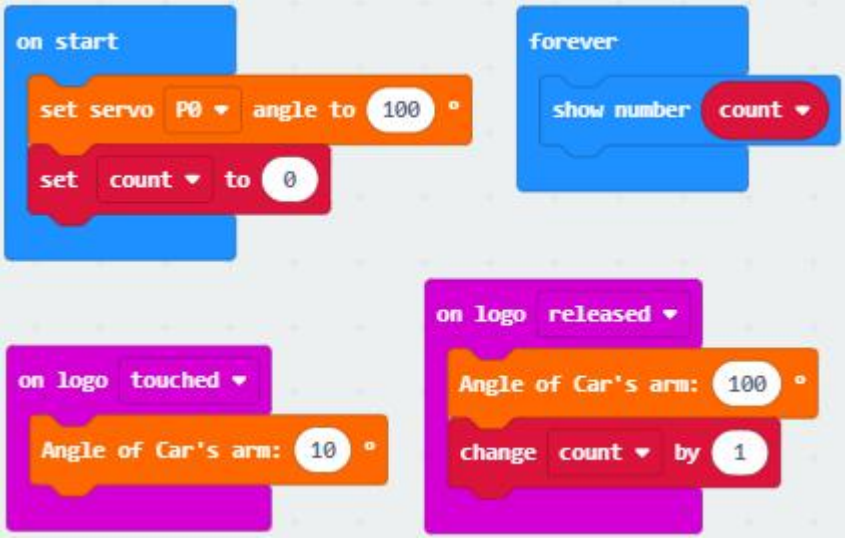
2.Preparation:

- A desk bit car
- Place batteries into battery holder
- Dial the DIP switch to ON end to power on
- Dial the DIP switch to SERVO end
- Interface micro:bit V2 with computer using USB cable
- Enter online Makecode editor.

You don’ t need to add Desk Bit extension library(refer to chapter 4.6) if you choose to import Hex file.

However, you need to add desk bit extension library first if you intend to edit code in the Makecode window(refer to chapter 4.4).

3.Test Code and Results:



Plug in power, touch logo of V2 board, then desk bit car will rotate its arm; however, the arm of desk bit car will return the original place if not touching logo; V2 board will show how many times you touch.

Project 16: Desk Bit Walks

1.Description:

This chapter introduces how to control 360° servo. We will make desk bit car go forward and backward, turn left and right and stop.

2. Preparation:

- A desk bit car

- Place batteries into battery holder
- Dial the DIP switch to ON end to power on
- Dial the DIP switch to SERVO end.
- Interface micro:bit V2 with computer using USB cable
- Enter online Makecode editor.

You don’ t need to add Desk Bit extension library(refer to chapter 4.6) if you choose to import Hex file.

However, you need to add desk bit extension library first if you intend to edit code in the Makecode window(refer to chapter 4.4).

3.Test Code and Results:

Download code to micro:bit V2, dial DIP switch to ON end to power on. The car runs forward, backward, turns and right and stops.

Project 17: Sing and Dance

1. Description:

In this lesson, we will make desk bit car sing and dance.

2.Preparation:

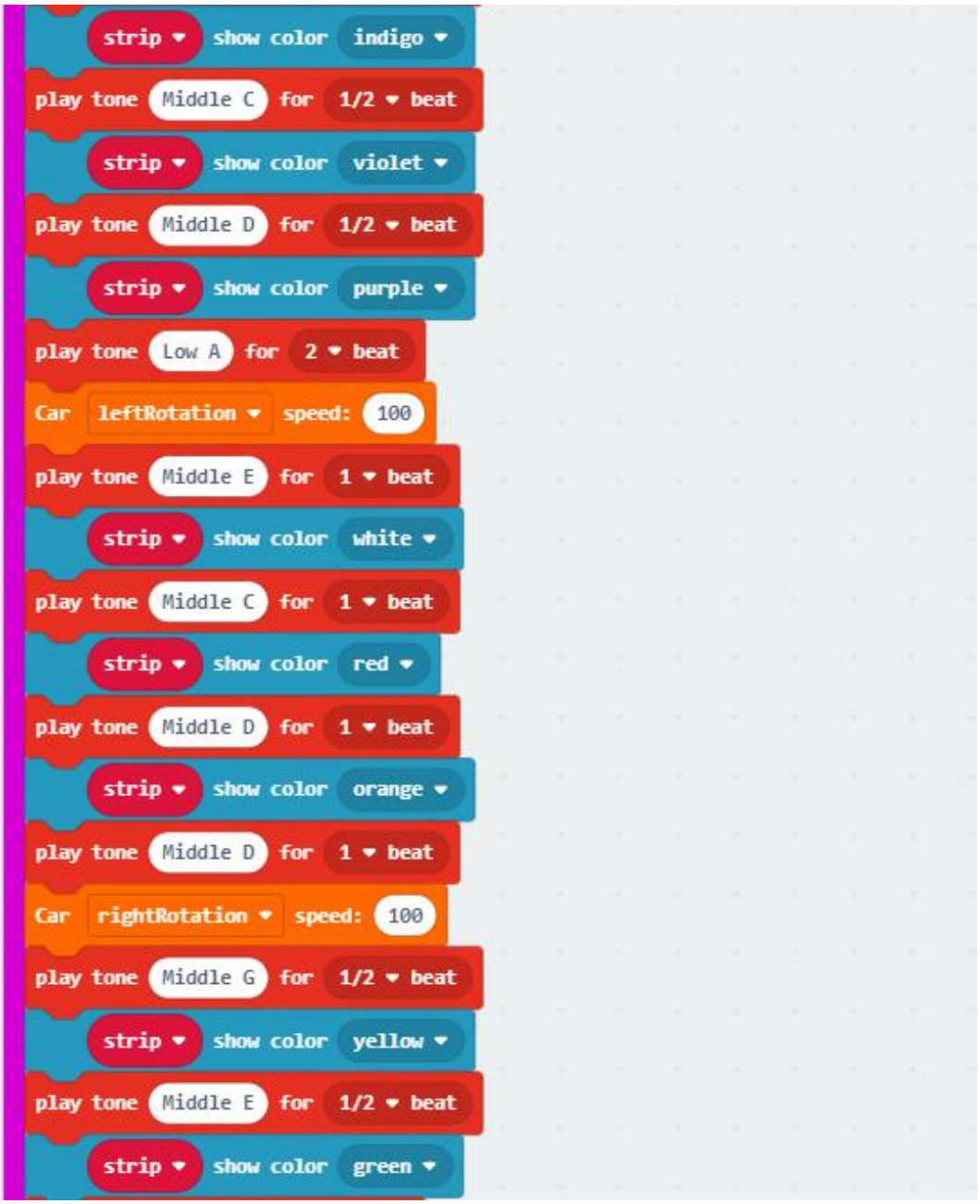
- A desk bit car
- Place batteries into battery holder
- Dial the DIP switch to ON end to power on
- Dial the DIP switch to RGB end
- Interface micro:bit V2 with computer using USB cable
- Enter online Makecode editor.

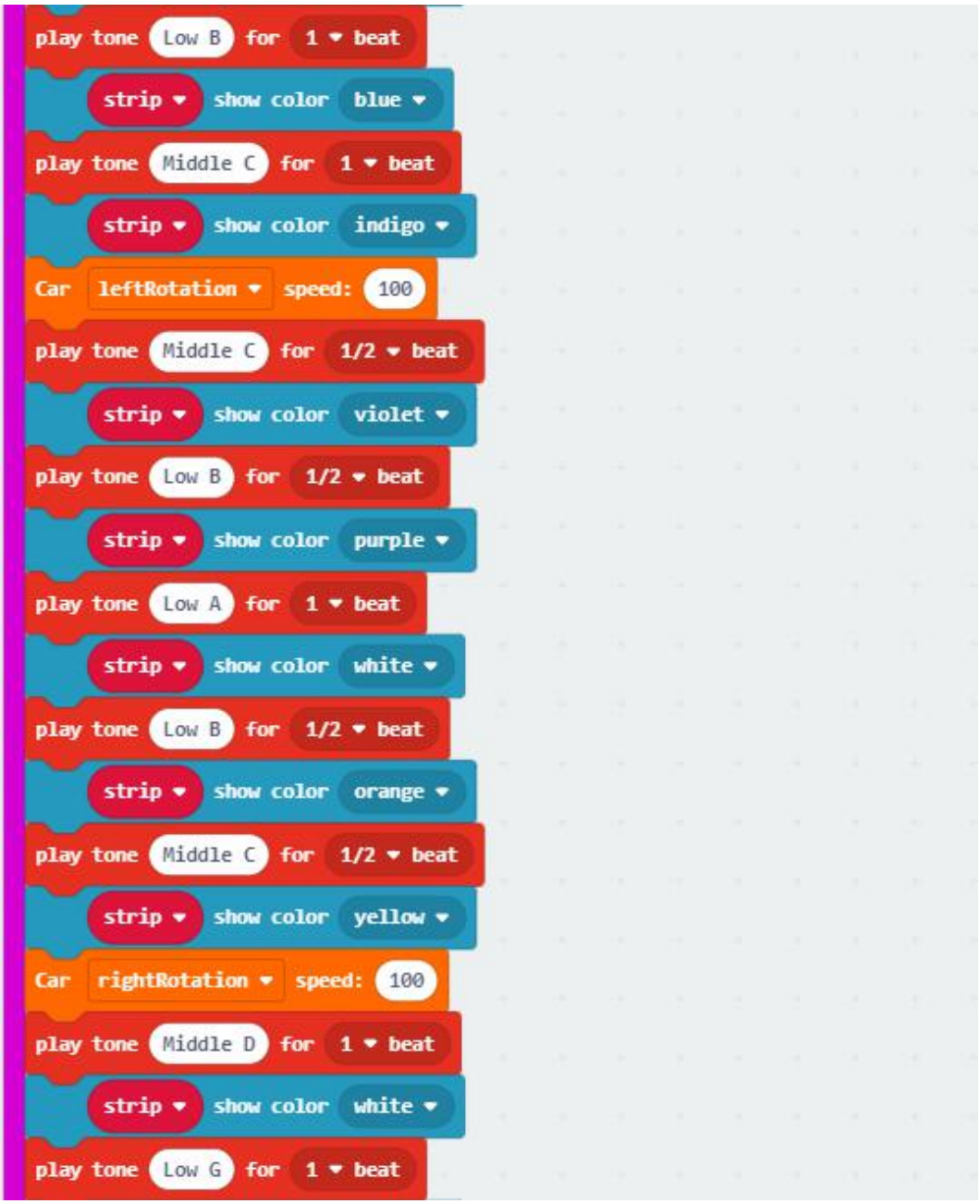
You don’ t need to add Desk Bit extension library(refer to chapter 4.6) if you choose to import Hex file.

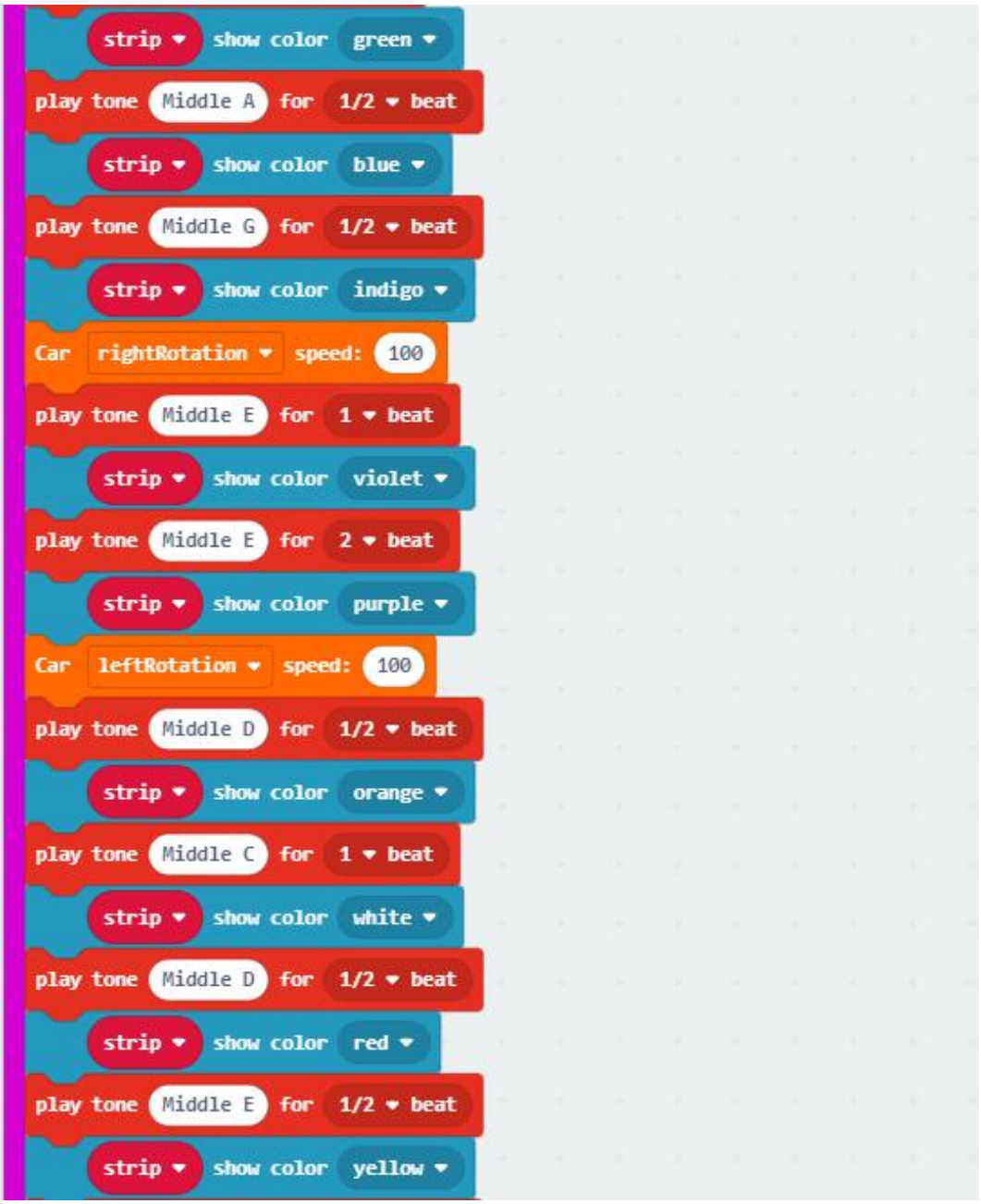
However, you need to add desk bit extension library first if you intend to edit code in the Makecode window(refer to chapter 4.4).

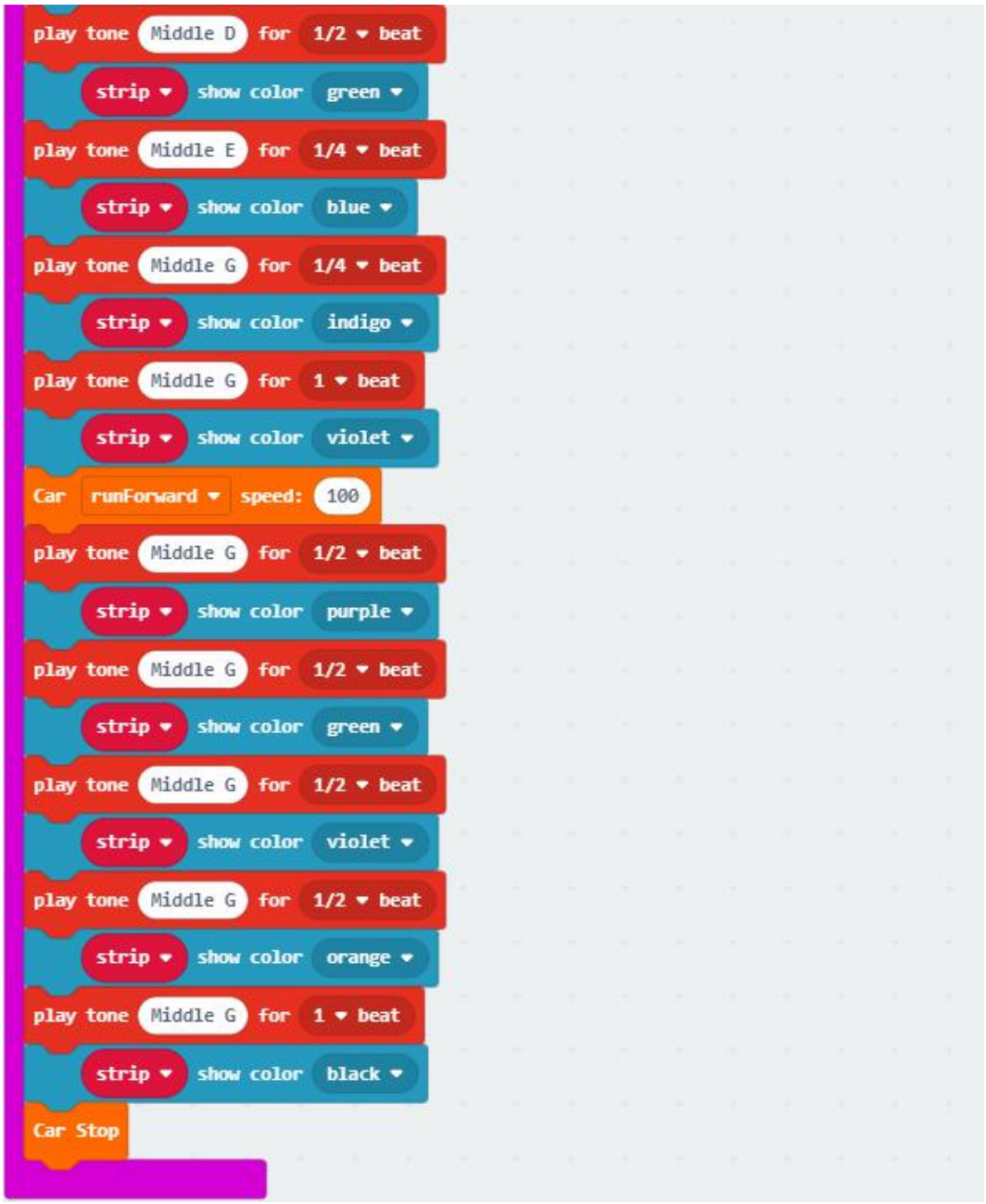
3.Test Code and Results:


on start
show icon
set strip to NeoPixel at pin P0 with 5 leds as RGB (GRB format)
on button A pressed
Car runForward speed: 100
strip show color red
play tone Middle E for 1 beat
strip show color blue
play tone Middle C for 1 beat
Car runBack speed: 100
play tone Middle D for 1 beat
strip show color green
play tone Low A for 1 beat
strip show color yellow
Car runForward speed: 100
play tone Middle E for 1/2 beat
strip show color orange
play tone Middle D for 1/2 beat

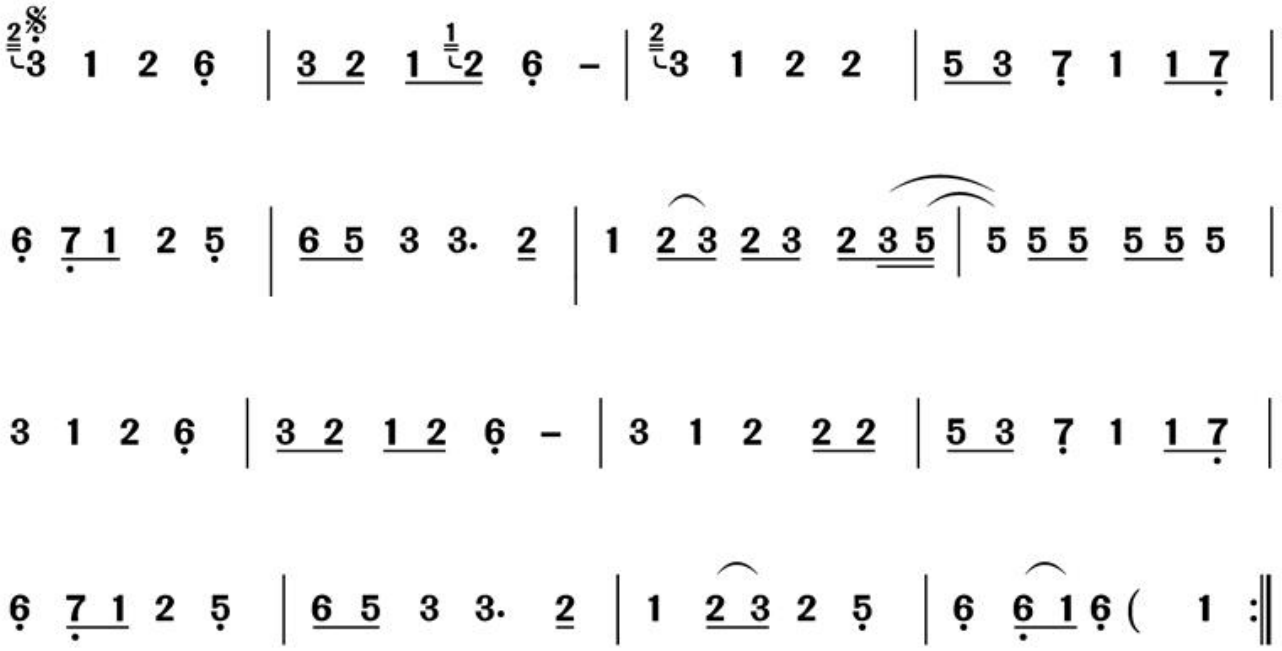

strip show color indigo
play tone Middle C for 1/2 beat
strip show color violet
play tone Middle D for 1/2 beat
strip show color purple
play tone Low A for 2 beat
Car leftRotation speed: 100
play tone Middle E for 1 beat
strip show color white
play tone Middle C for 1 beat
strip show color red
play tone Middle D for 1 beat
strip show color orange
play tone Middle D for 1 beat
Car rightRotation speed: 100
play tone Middle G for 1/2 beat
strip show color yellow
play tone Middle E for 1/2 beat
strip show color green


play tone Low B for 1 beat
strip show color blue
play tone Middle C for 1 beat
strip show color indigo
Car leftRotation speed: 100
play tone Middle C for 1/2 beat
strip show color violet
play tone Low B for 1/2 beat
strip show color purple
play tone Low A for 1 beat
strip show color white
play tone Low B for 1/2 beat
strip show color orange
play tone Middle C for 1/2 beat
strip show color yellow
Car rightRotation speed: 100
play tone Middle D for 1 beat
strip show color white
play tone Low G for 1 beat


strip show color green
play tone Middle A for 1/2 beat
strip show color blue
play tone Middle G for 1/2 beat
strip show color indigo
Car rightRotation speed: 100
play tone Middle E for 1 beat
strip show color violet
play tone Middle E for 2 beat
strip show color purple
Car leftRotation speed: 100
play tone Middle D for 1/2 beat
strip show color orange
play tone Middle C for 1 beat
strip show color white
play tone Middle D for 1/2 beat
strip show color red
play tone Middle E for 1/2 beat
strip show color yellow


play tone Middle D for 1/2 beat
strip show color green
play tone Middle E for 1/4 beat
strip show color blue
play tone Middle G for 1/4 beat
strip show color indigo
play tone Middle G for 1 beat
strip show color violet
Car runForward speed: 100
play tone Middle G for 1/2 beat
strip show color purple
play tone Middle G for 1/2 beat
strip show color green
play tone Middle G for 1/2 beat
strip show color violet
play tone Middle G for 1/2 beat
strip show color orange
play tone Middle G for 1 beat
strip show color black
Car Stop

Music Note:



More resource：https://en.wikipedia.org/wiki/Numbered_musical_notation

Download code to micro:bit V2 and dial DIP switch to ON end. Pressing A button, you will hear a song and desk bit car will go forward and backward, rotate to left and right, with RGB displaying different colors.

Project 18: Dodge Bullet

1.Description:

In this project, we will introduce an interesting game-----Dodge Bullet

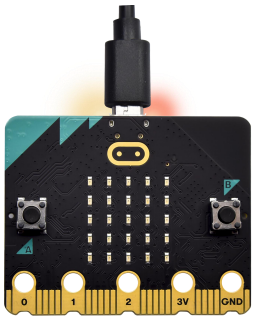
You can play this game with button A and B.

2.Components:

- Micro:bit V2 *1
- Micro USB Cable*1

3. Wiring Up:

Interface micro:bit V2 with your computer using micro USB cable.



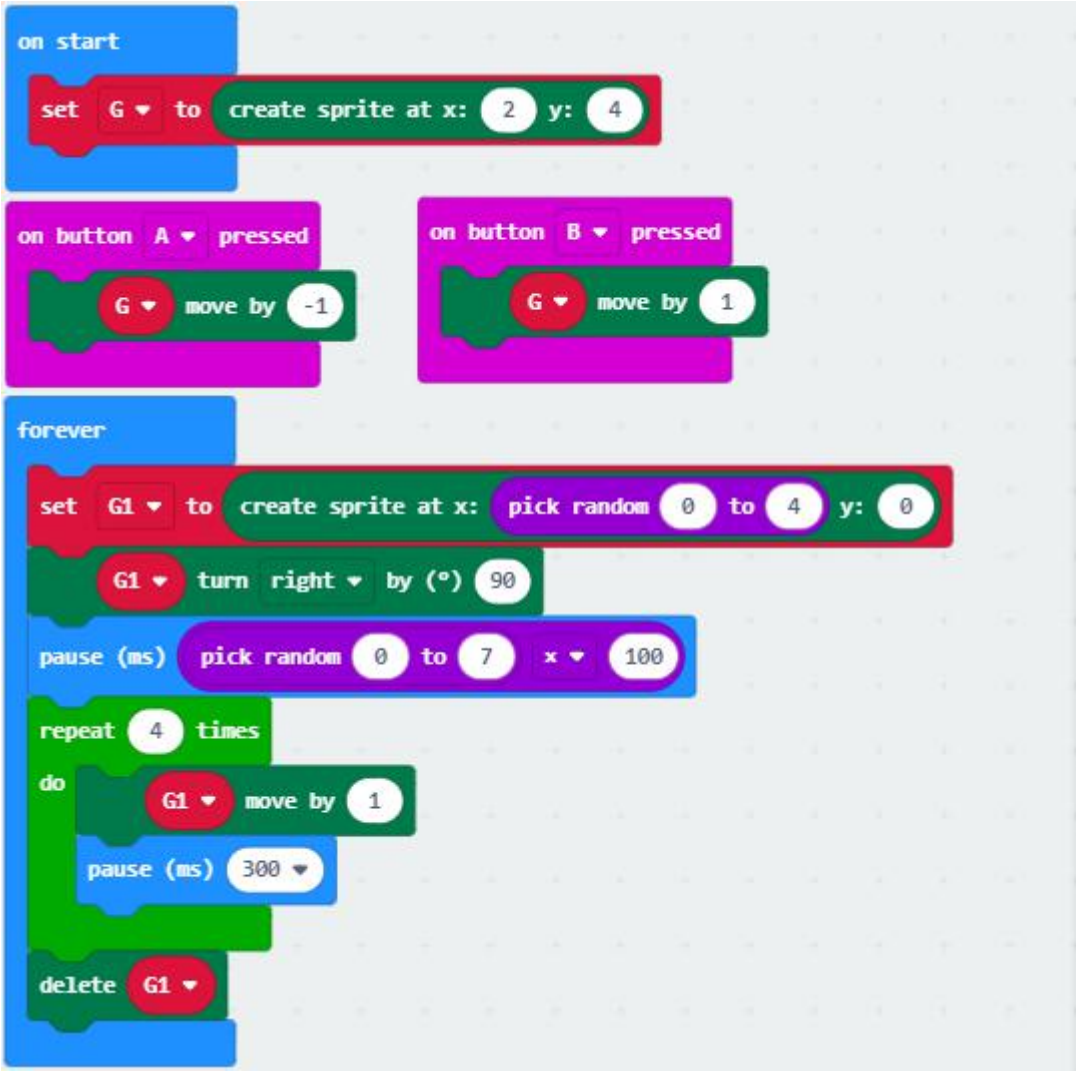
4.Game 1:

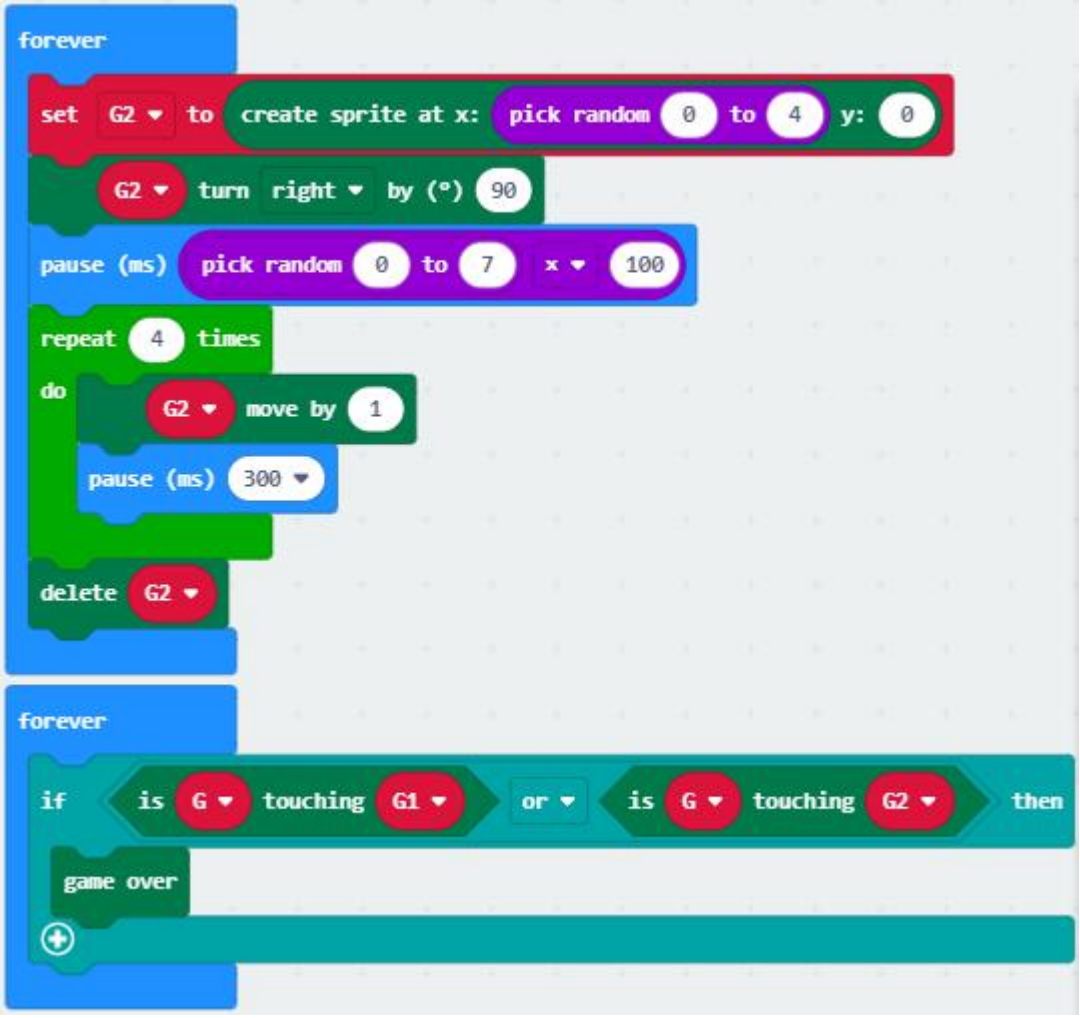
This game should be played on micro:bit V2. There are random LED G1 and G2 lit , and an LED G(at the bottom of micro:bit V2).

When G1 and G2 are falling down, you can move them to left and right with button A and B so as to prevent G from attacking.

If one of them attacks G, game will be over. However, game starts when pressing A and B at same time.

5.Test Code and Results 1:


on start
set G to create sprite at x: 2 y: 4
on button A pressed
G move by -1
on button B pressed
G move by 1
forever
set G1 to create sprite at x: pick random 0 to 4 y: 0
G1 turn right by (°) 90
pause (ms) pick random 0 to 7 x 100
repeat 4 times
do
G1 move by 1
pause (ms) 300
delete G1

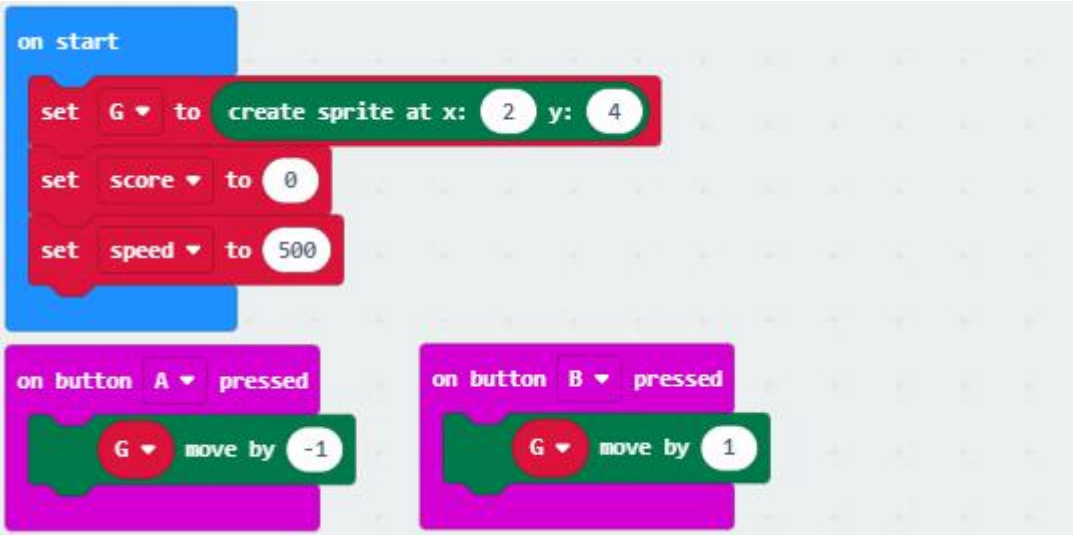


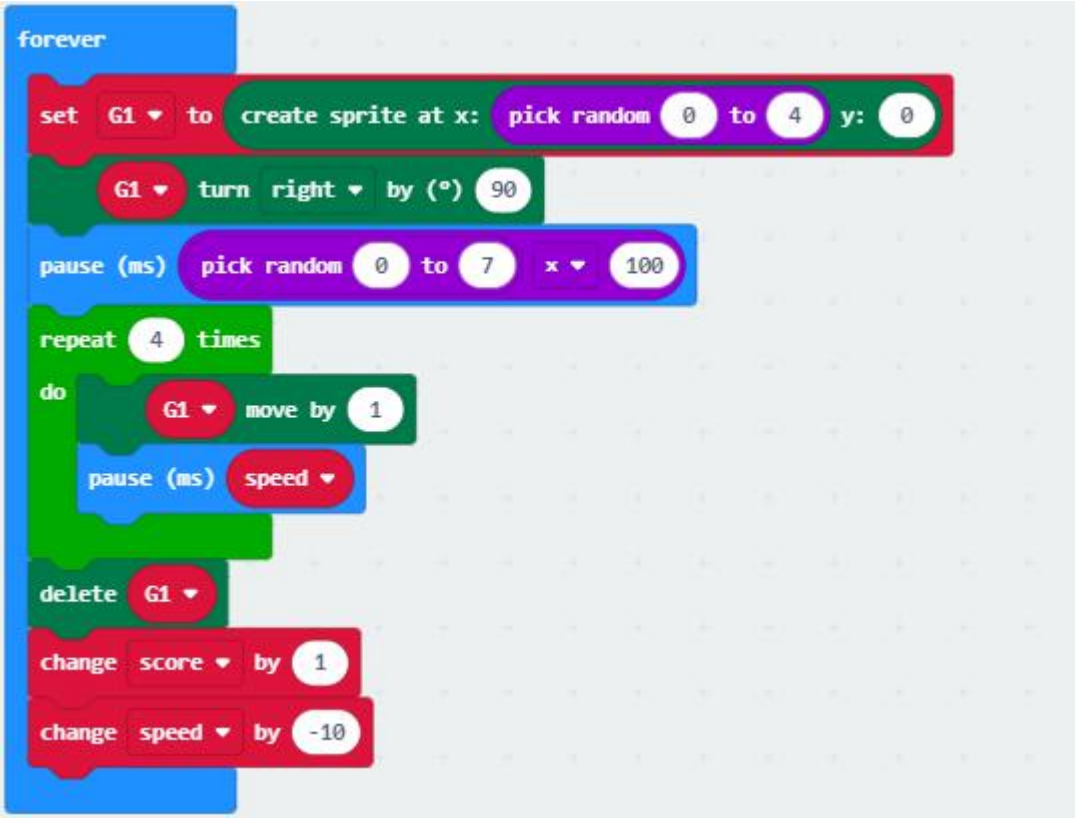
Download code to micro:bit V2. You can view some random LEDs falling. Then you need to press button A and B to stop them from attacking G.

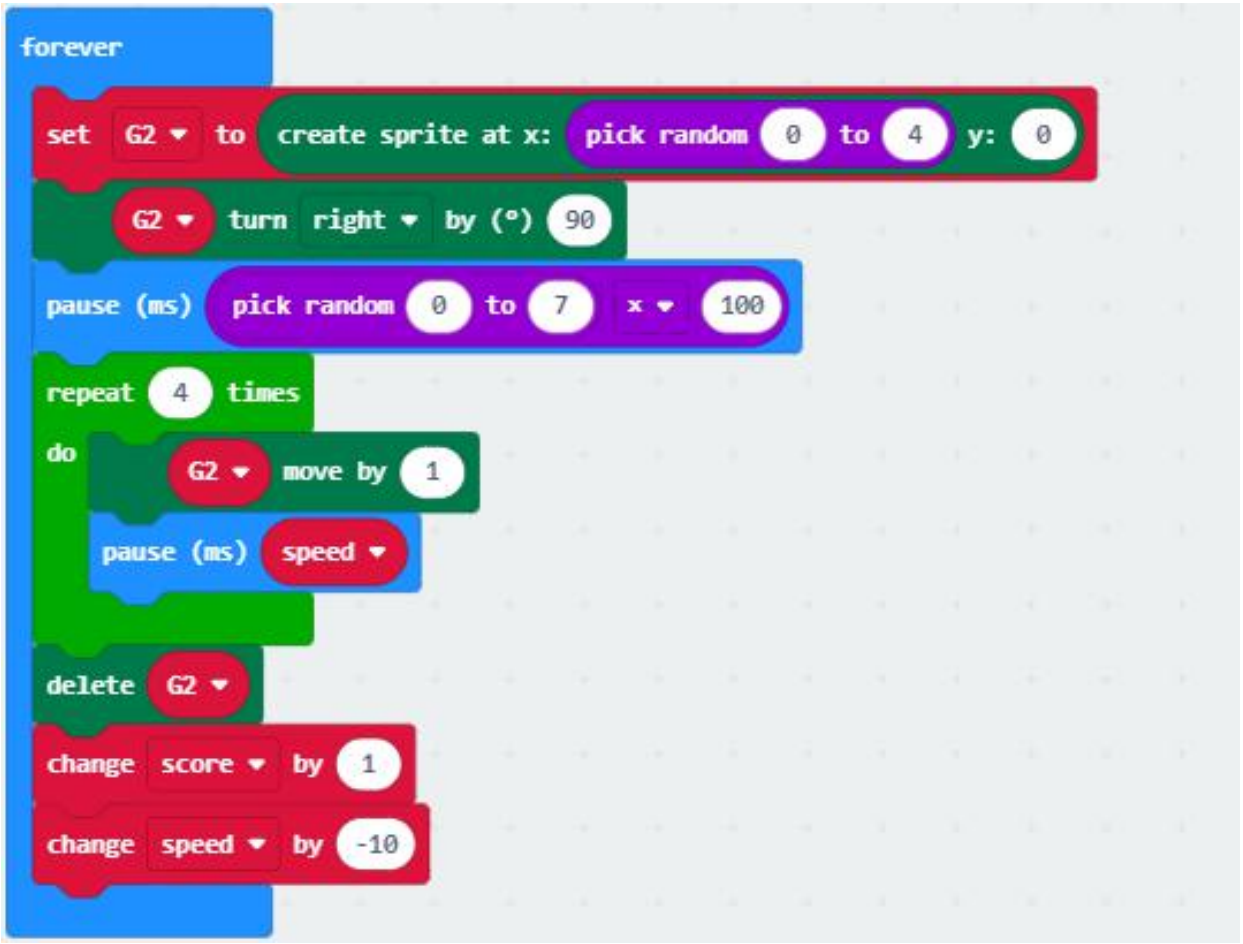
6. Game 2:

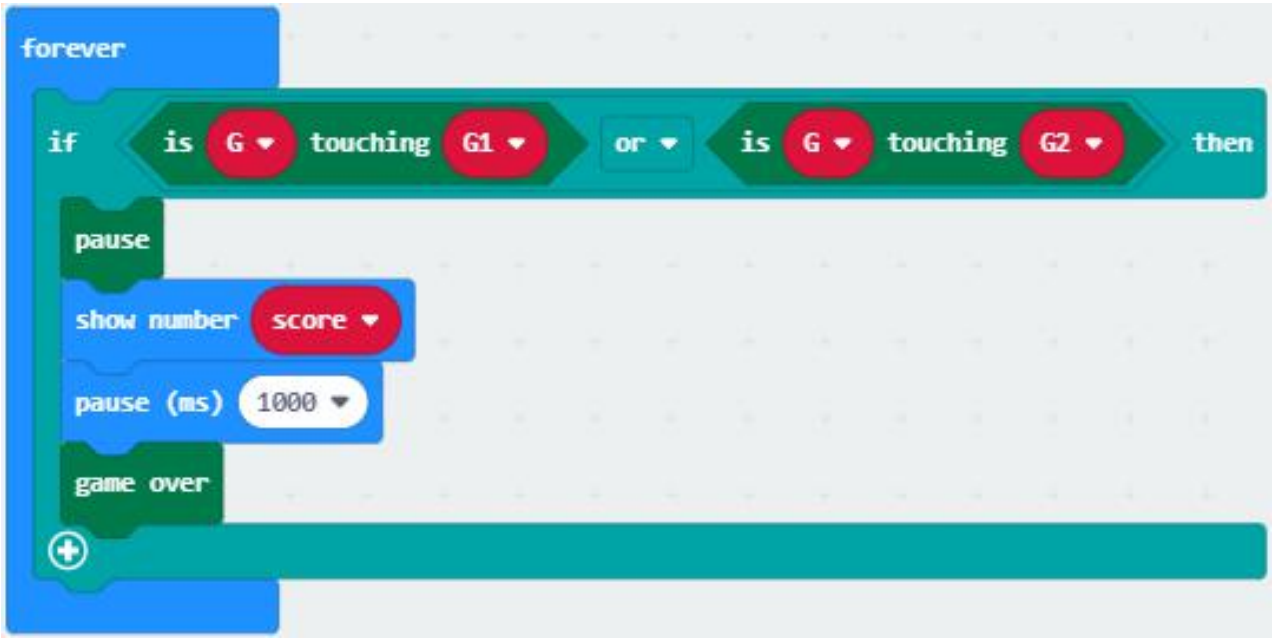
For game 2, we make a change in the game 1. You can be given one point if G avoids the random falling down LED, however, if it meets random LED, game will be over and the scores will appear. Press button A and B at same time to start new game.

7.Test Code and Results 2:









Download code to micro:bit V2. You can press button A and B to control G

when the random lit LED is falling down

You can be given one point if G dodges the random falling and lit LED, however,if it meets random LED, game will be over and the scores will appear. Press button A and B at same time to start new game.

Project 19: Read Bluetooth Data

1. Description:

The micro:bit V2 integrates the low consumption BLE device and pairs with phones or iPad. Thus, we can build communication between V2 board and device.

Micro:bit V2 has on-board Bluetooth for iOS and Android system.

In this project, we will introduce how to use App and its App interface.

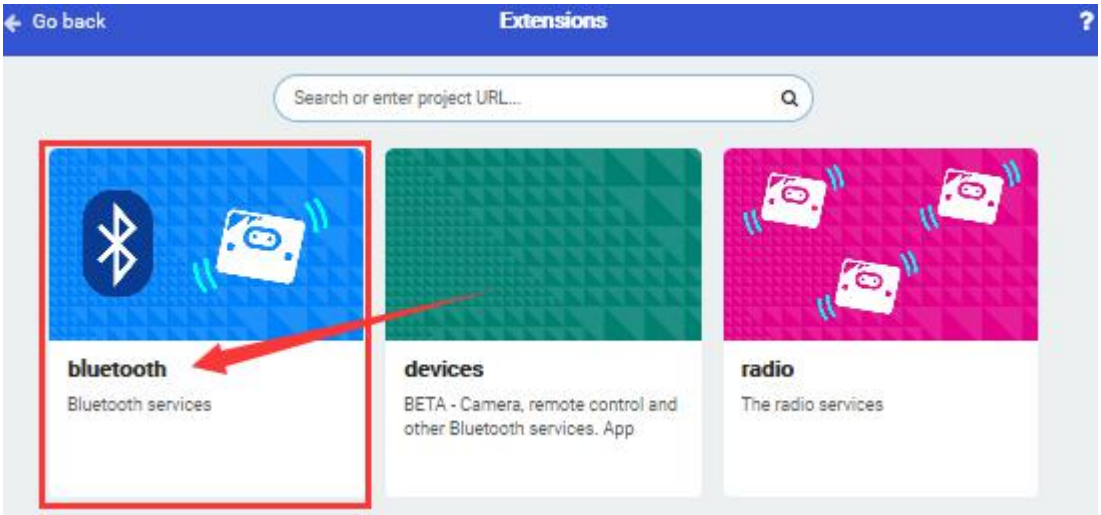
2. Preparation:

(1) A desk bit car

(2) Interface micro:bit V2 with computer using USB cable.

You don’ t need to add Bluetooth extension library(refer to chapter 4.6) if you choose to import Hex file.

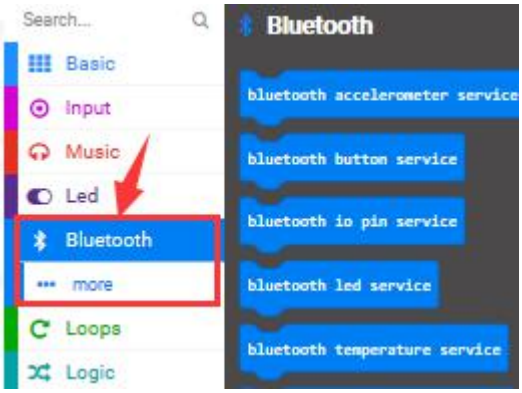
However, you need to add Bluetooth extension library first if you intend to edit code in the Makecode window. As shown below:



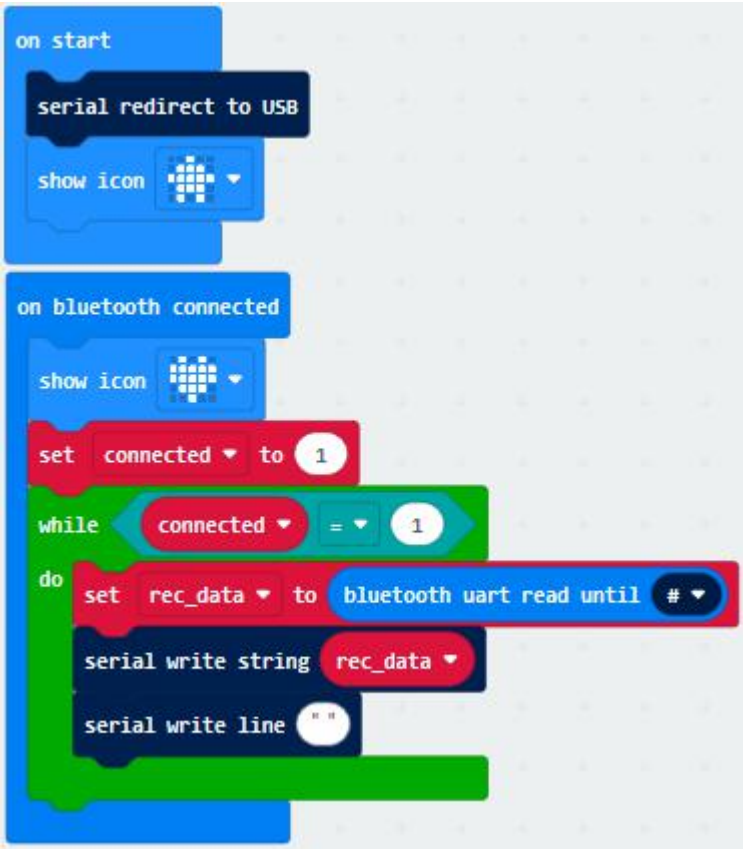
Bluetooth can’ t work with radio at same time because of hardware, therefore, their libraries are not compatible either.

The prompt will inform of you to delete radio library, as shown below

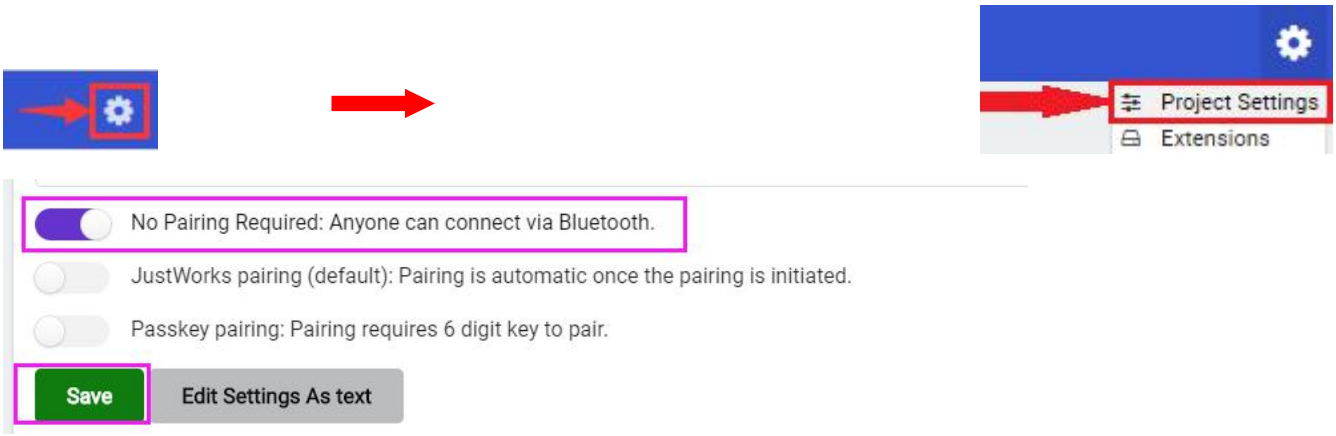
Then “Bluetooth” extension library will be installed, as shown below



3. Test Code and Results:



You need to set Bluetooth to “No Pairing Required” mode, the detailed steps are shown below:



Click “Save” to finish the setting.

Note: you can skip this step if you directly import code.

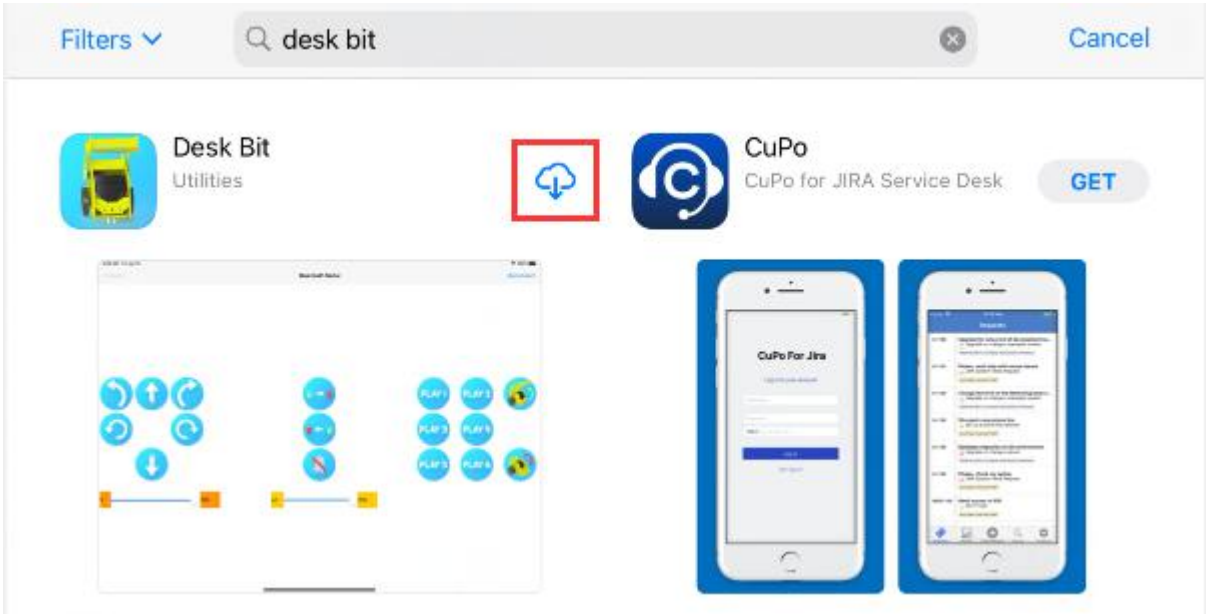
Next to download code to micro:bit V2 and plug in power with USB cable.

Now, let’ s install App.

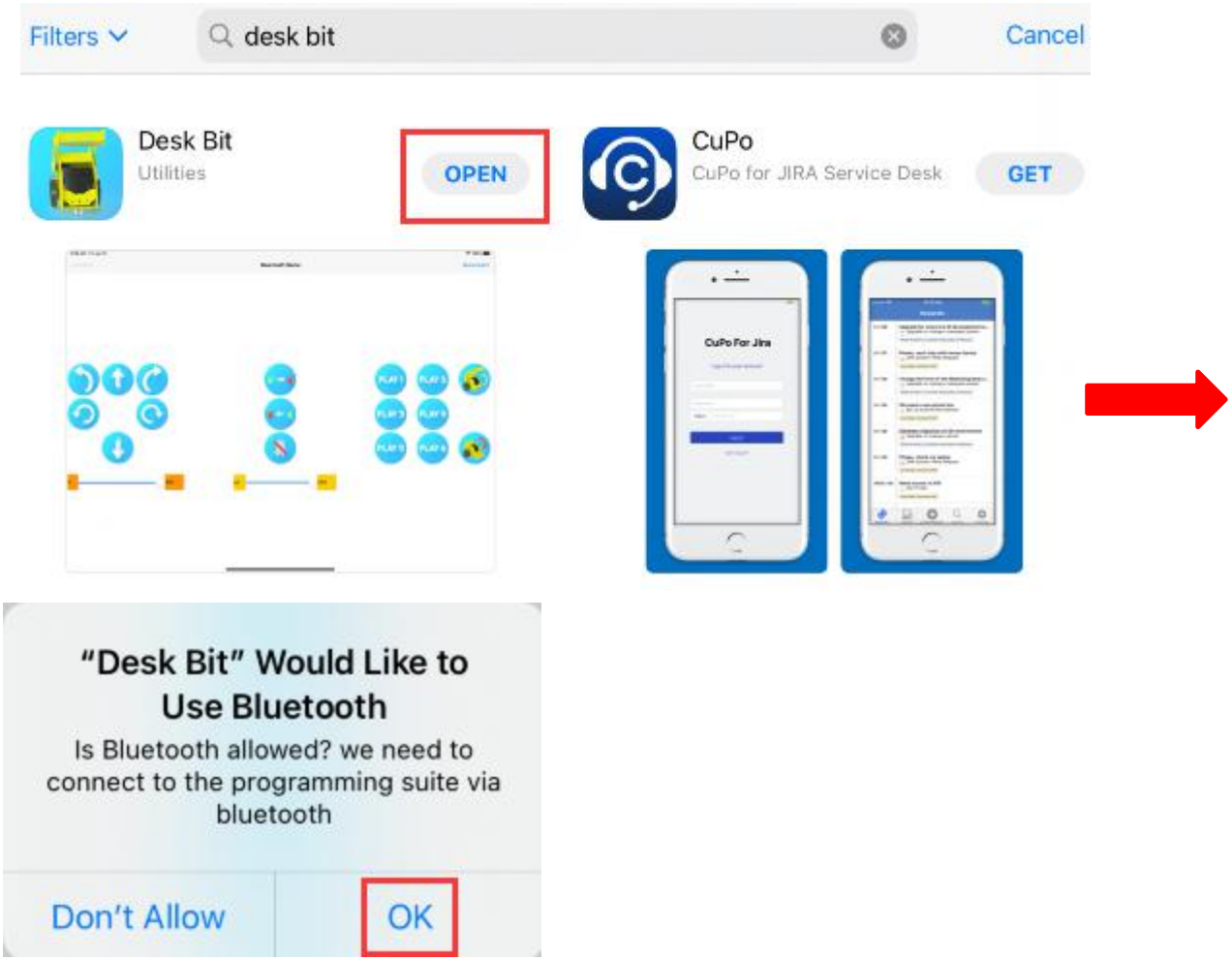
IOS system

a. Open App Store

b. Search desk bit and click “ ” icon to download



c. After the download, open Desk Bit app and click “OK”, as shown below.



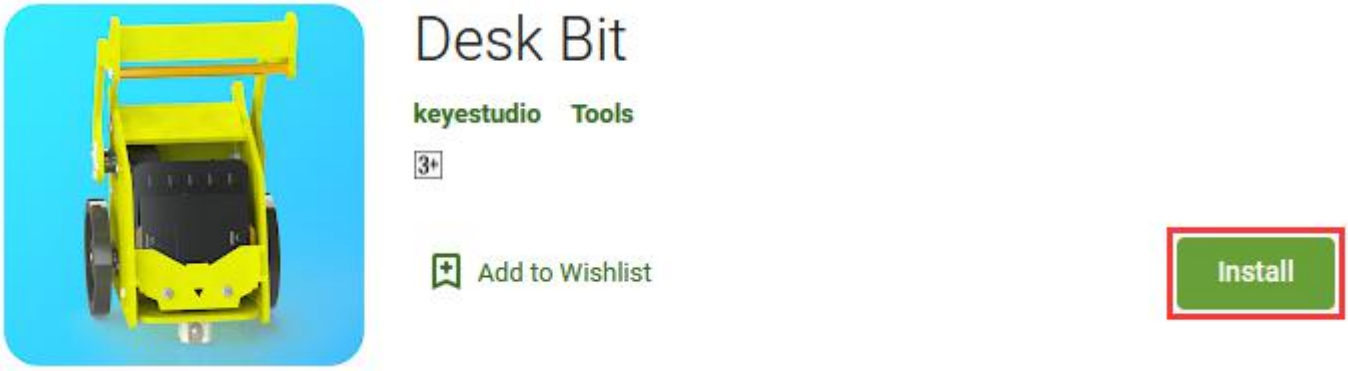
d. Enable Bluetooth of your device, click "Connect" icon on App and choose "BCC micro:bit " among the searching results, after a while, Bluetooth is connected.

Android System

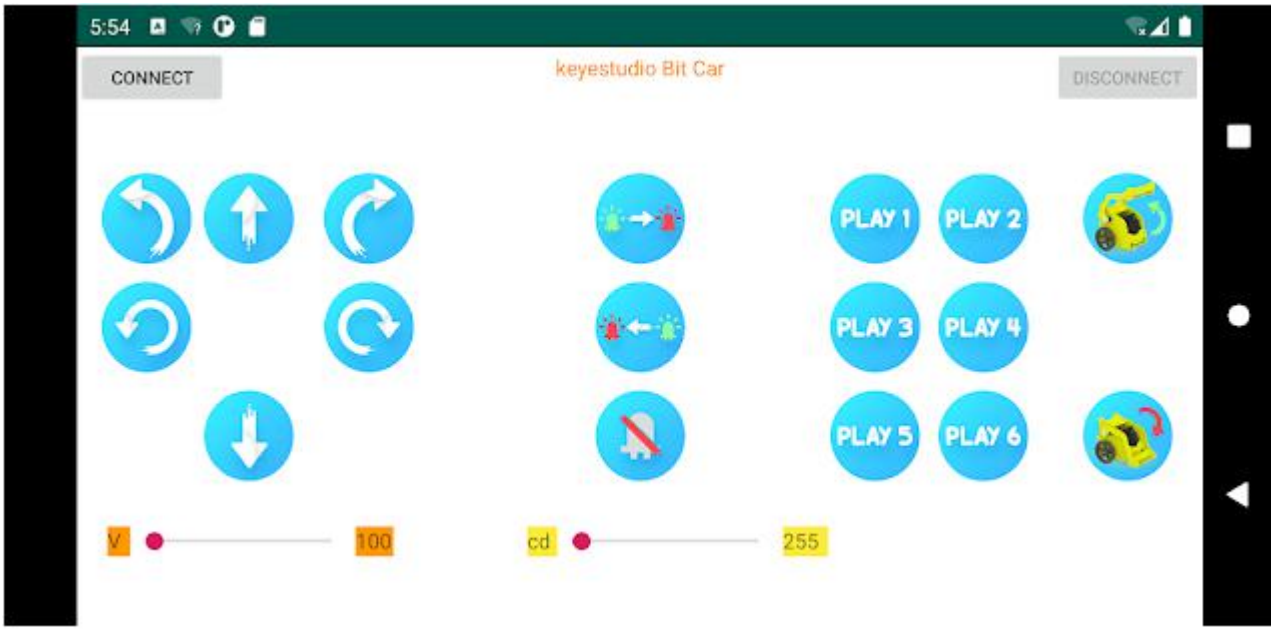
Navigate the website https://play.google.com/store/apps/details?id=com.keyestudio.deskbit to download App. Perhaps you can download Desk Bit App in the Google play

store.

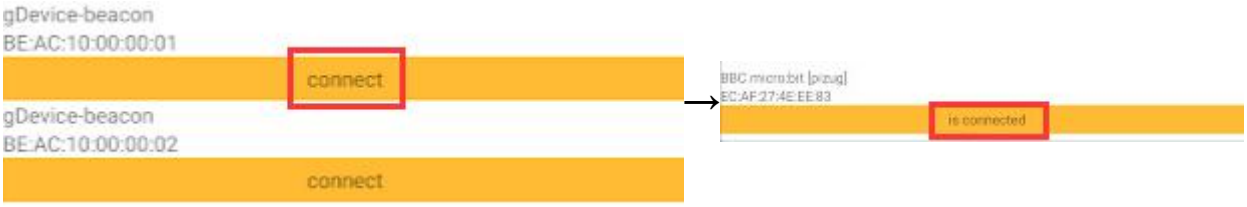
Note: Allow app to access your location.



Open “Desk Bit”, the interface is shown below



Enable Bluetooth of cellphone, click “Connect” and select “BCC micro:bit” among the searching results. Then click “connect”, Bluetooth is connected, as shown below;



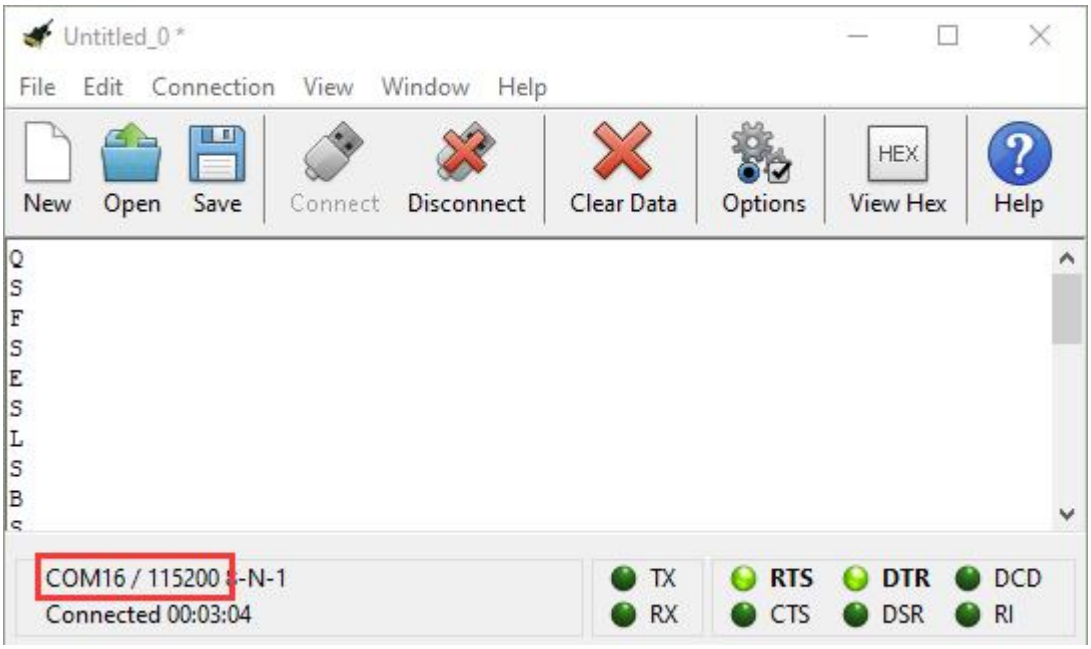
The icon "Show console device" won't be shown on Makecode editor due to the Bluetooth of micro:bit V2, therefore, the control characters sent by App can't be read either.

Here, the CoolTerm software is needed, which is used to read the characters sent by App.

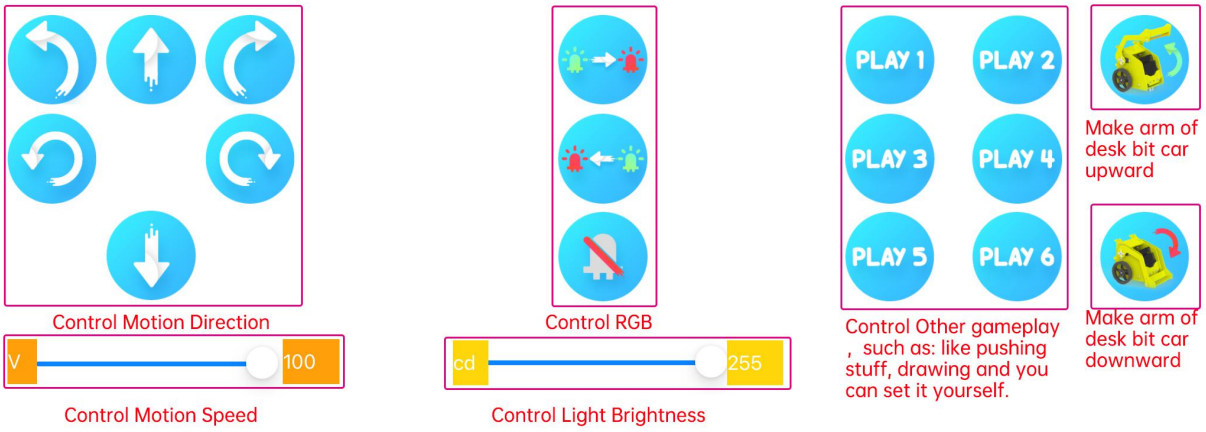
Open "CoolTerm", click "Options" to select "SerialPort", and set "COM" port and 115200 baud rate(the baud rate of USB serial communication of micro:bit V2 is 115200 through the test).

Then click "OK" and "Connect".

The light intensity value is shown below:



The function of each icon on App is shown below:



Project 20: Control LED Dot Matrix by Bluetooth

1.Description:

In this lesson, we will make micro:bit V2 show pictures and numbers via

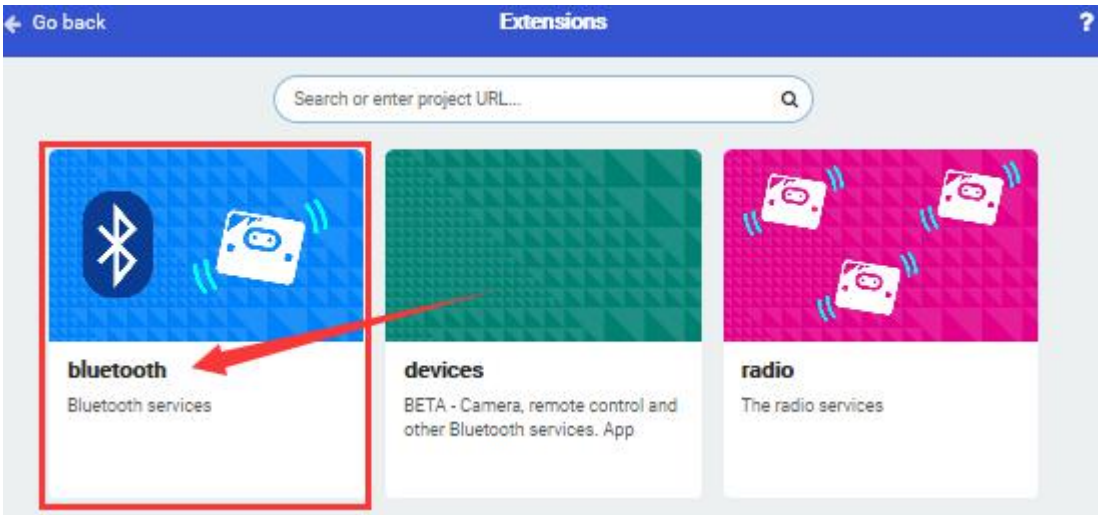
App.

3. Preparation:

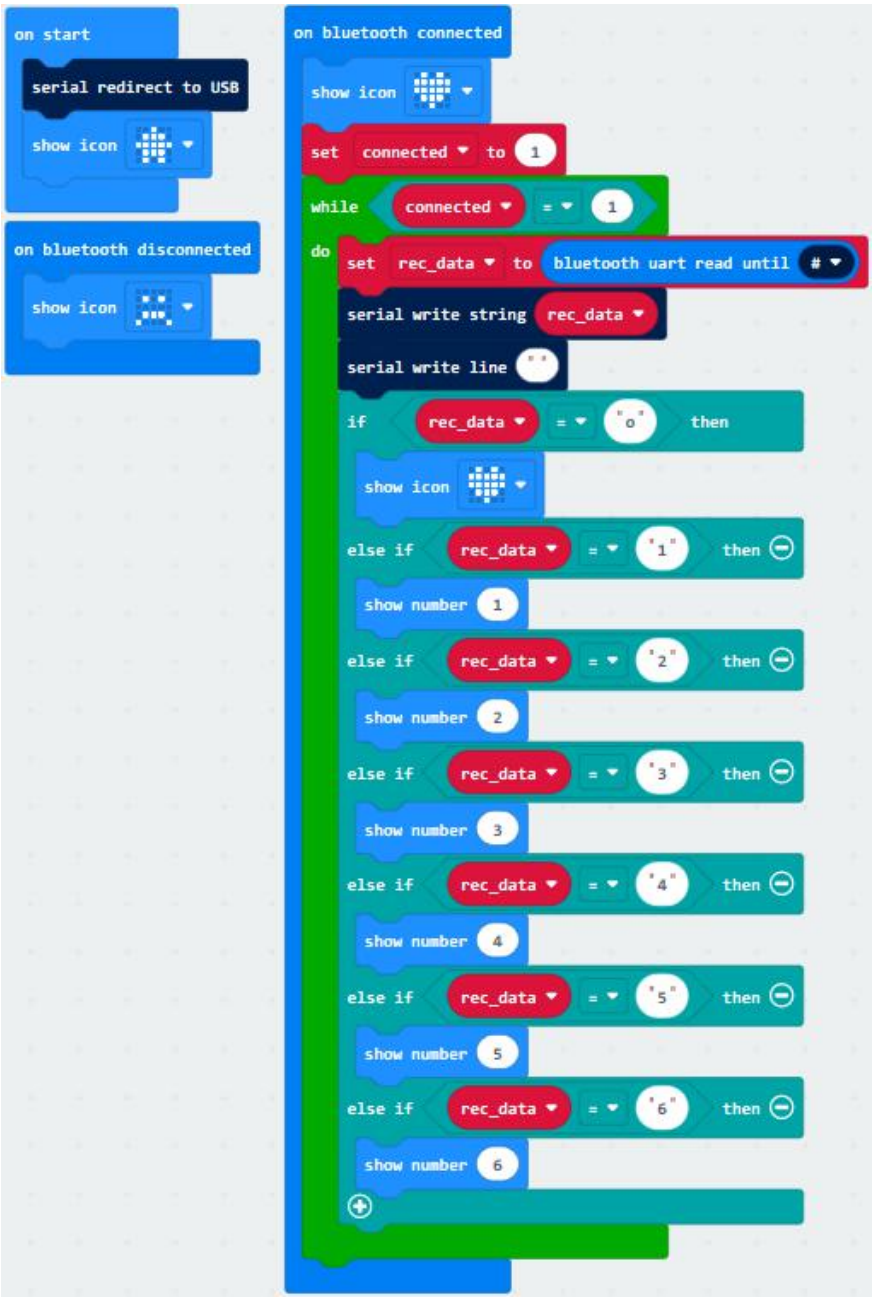
- A desk bit car
- Interface micro:bit V2 with computer using USB cable

You don’ t need to add Bluetooth extension library(refer to chapter 4.6) if you choose to import Hex file.

However, you need to add Bluetooth extension library first if you intend to edit code in the Makecode window. As shown below:



3. Test Code and Results:



Download code to micro:bit V2, and plug in power with USB cable.

Micro:bit V2 will show “ ” , then open APP and connect Bluetooth.

Next, the character "o" will be sent and pattern "  " will appear. Tick  to send character "1", LED dot matrix will display 1;

Click  to send character "2", micro:bit V2 shows "2"; click  to send character "3", number "3" is shows on LED dot matrix; click  to send character "4", number "4" is shows on LED dot matrix; click  to send character "5", number "5" is shows on LED dot matrix; click  to send character "6", number "6" is shows on LED dot matrix; click "disconnect" icon on App to disconnect Bluetooth, pattern "  " appears on LED dot matrix.

Project 21: Multi-purpose Desk Bit Car

1. Description:

In previous lesson, we introduced how to use App and test each icons.

In this lesson, we will control the desk bit car via App to make it perform

different functions.

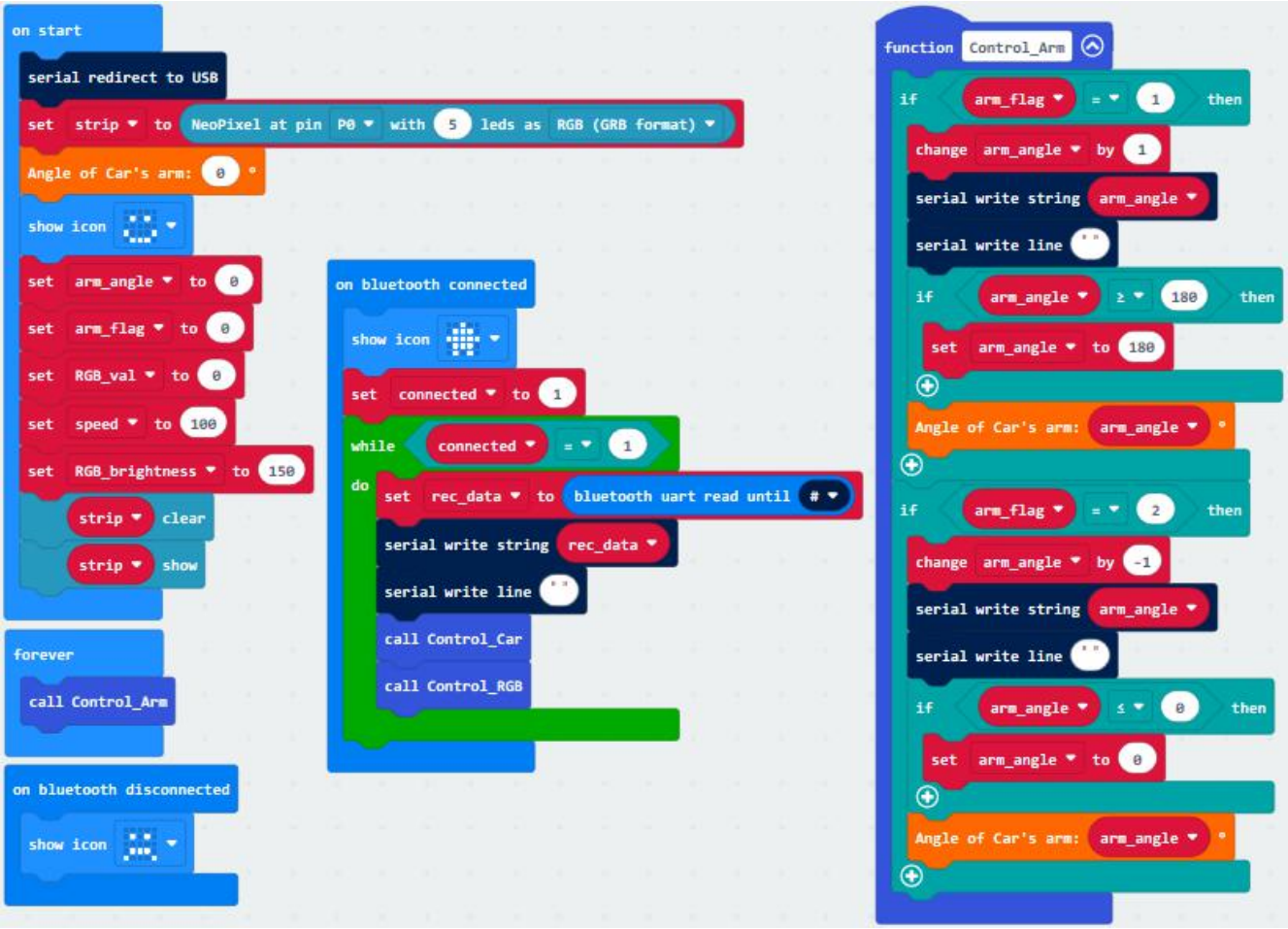
2. Preparation:

- A desk bit car
- Place batteries into battery holder
- Dial the DIP switch to ON end
- Interface micro:bit V2 with computer using USB cable
- Enter online Makecode editor.

You don’ t need to add desk bit extension library(refer to chapter 4.6) if you choose to import Hex file.

However, you need to add desk bit extension library first if you intend to edit code in the Makecode window(refer to chapter 4.4).

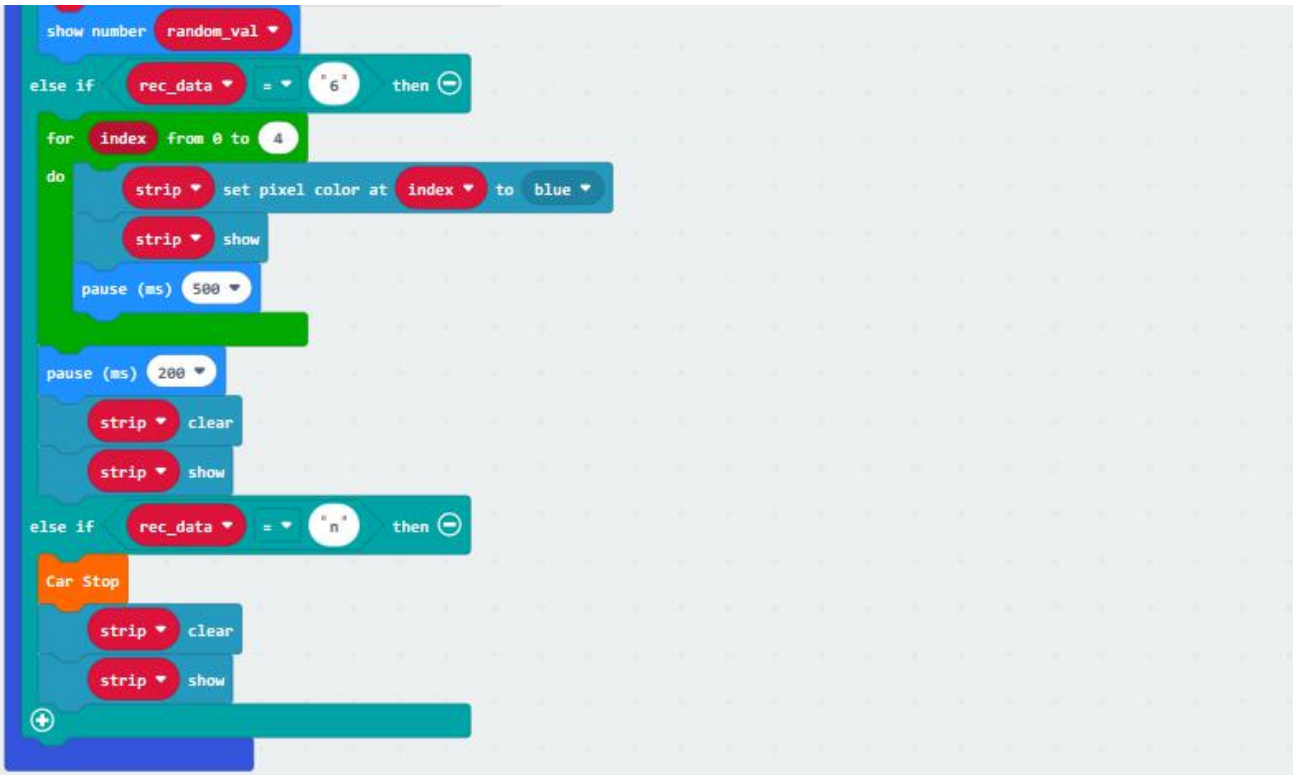
3. Test Code and Results:


on start
serial redirect to USB
set strip to NeoPixel at pin P0 with 5 leds as RGB (GRB format)
Angle of Car's arm: 0 °
show icon
set arm_angle to 0
set arm_flag to 0
set RGB_val to 0
set speed to 100
set RGB_brightness to 150
strip clear
strip show
forever
call Control_Arm
on bluetooth disconnected
show icon
on bluetooth connected
show icon
set connected to 1
while connected = 1
do
set rec_data to bluetooth uart read until #
serial write string rec_data
serial write line ""
call Control_Car
call Control_RGB
function Control_Arm
if arm_flag = 1 then
change arm_angle by 1
serial write string arm_angle
serial write line ""
if arm_angle ≥ 180 then
set arm_angle to 180
Angle of Car's arm: arm_angle °
if arm_flag = 2 then
change arm_angle by -1
serial write string arm_angle
serial write line ""
if arm_angle ≤ 0 then
set arm_angle to 0
Angle of Car's arm: arm_angle °


function Control_Car
if rec_data = "p" then
set speed_val to bluetooth uart read until #
set speed to parse to number speed_val
serial write number speed
serial write line ""
if rec_data = "F" then
Car runForward speed: speed
else if rec_data = "L" then
Car leftRotation speed: speed
else if rec_data = "R" then
Car rightRotation speed: speed
else if rec_data = "B" then
Car runBack speed: speed
else if rec_data = "Q" then
Car left wheel forward speed: 50
Car right wheel forward speed: 100
else if rec_data = "E" then
Car left wheel forward speed: 100
Car right wheel forward speed: 50
function Control_RGB
if rec_data = "c" then
change RGB_val by 1
if RGB_val ≥ 9 then
set RGB_val to 9
else if rec_data = "b" then
change RGB_val by -1
if RGB_val ≤ 1 then
set RGB_val to 1
else if rec_data = "s" then
strip show color black
set RGB_val to 0
else if rec_data = "g" then
set RGB_bright to bluetooth uart read until #
set RGB_brightness to parse to number RGB_bright
serial write number RGB_brightness
serial write line ""
strip set brightness RGB_brightness
strip show

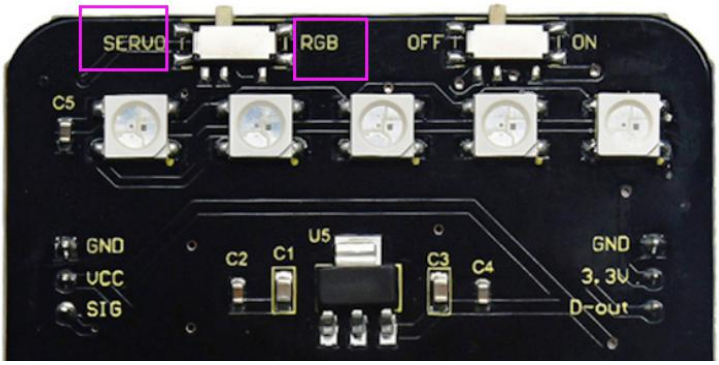

else if rec_data = "S" then
Car Stop
else if rec_data = "o" then
show icon
else if rec_data = "u" then
set arm_flag to 1
else if rec_data = "d" then
set arm_flag to 2
else if rec_data = "m" then
set arm_flag to 0
else if rec_data = "1" then
Angle of Car's arm: 90 °
pause (ms) 200
Angle of Car's arm: 30 °
pause (ms) 200
Angle of Car's arm: 90 °
pause (ms) 200
Angle of Car's arm: 0 °
pause (ms) 200
else if rec_data = "2" then
Angle of Car's arm: 120 °
pause (ms) 200


if RGB_val = 1 then
strip show color red
strip set brightness RGB_brightness
strip show
else if RGB_val = 2 then
strip show color orange
strip set brightness RGB_brightness
strip show
else if RGB_val = 3 then
strip show color yellow
strip set brightness RGB_brightness
strip show
else if RGB_val = 4 then
strip show color green
strip set brightness RGB_brightness
strip show
else if RGB_val = 5 then
strip show color blue
strip set brightness RGB_brightness
strip show
else if RGB_val = 6 then
strip show color indigo

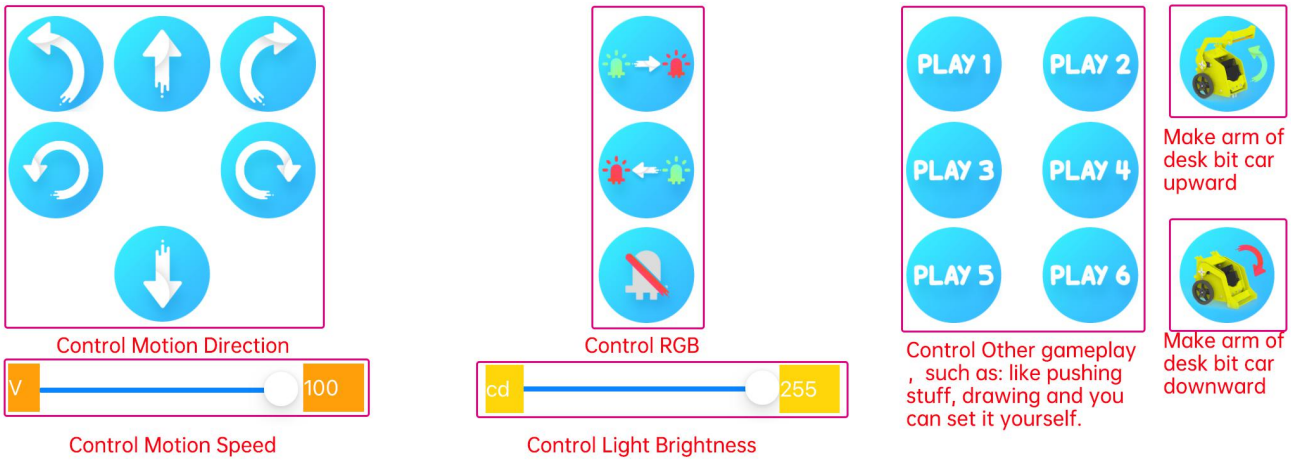


Note: Remember to dial the DIP switch to RGB end if you want to control RGB by Bluetooth.

Dial DIP switch to SERVO end if you want to control the servo of right arm.



The Keyestudio micro:bit desk bit car can be controlled by App.



Drawing

Back is a circular column

Place the pen of this kit into circular column, set code and download it to micro:bit V2, then the mini car can draw on the paper. Furthermore, you can make desk bit car push light stuffs by setting code.

7. Resources:

https://makecode.microbit.org/

https://tech.microbit.org/hardware/

https://microbit.org/new-microbit/

https://www.microbit.org/get-started/user-guide/overview/

https://microbit.org/get-started/user-guide/features-in-depth/

https://tech.microbit.org/hardware/edgeconnector/

https://microbit.org/guide/hardware/pins/

https://microbit.org/guide/quick/

https://microbit.org/get-started/user-guide/mobile/

https://microbit.org/code/

https://microbit.org/projects/