Introduction

(https://www.dfrobot.com/product-1748.htm)

This board can be a cool clock, a timer, a Lucky Turntable Game, a wearable ornament, and an interactive colored pendant. With a micro:bit main board, this 24 RGB LEDs circular expansion board changes to an exquisite creator's piece. You can turn it into a tomato timer via the onboard buzzer, and turn it into a colorful music spectrometer through the onboard microphone; There are two external ports P0, P1 in reserve, so you can get more ways to play by connecting a large number of boson and gravity sensors. With different paper-cuts and acrylics, you can put on a variety of new clothes for the expansion board. For example, put on red Chinese knot for it in Chinese New Year, put on the cartoon face for it at Children's Day, put on the snow or Christmas tree for it at Christmas......

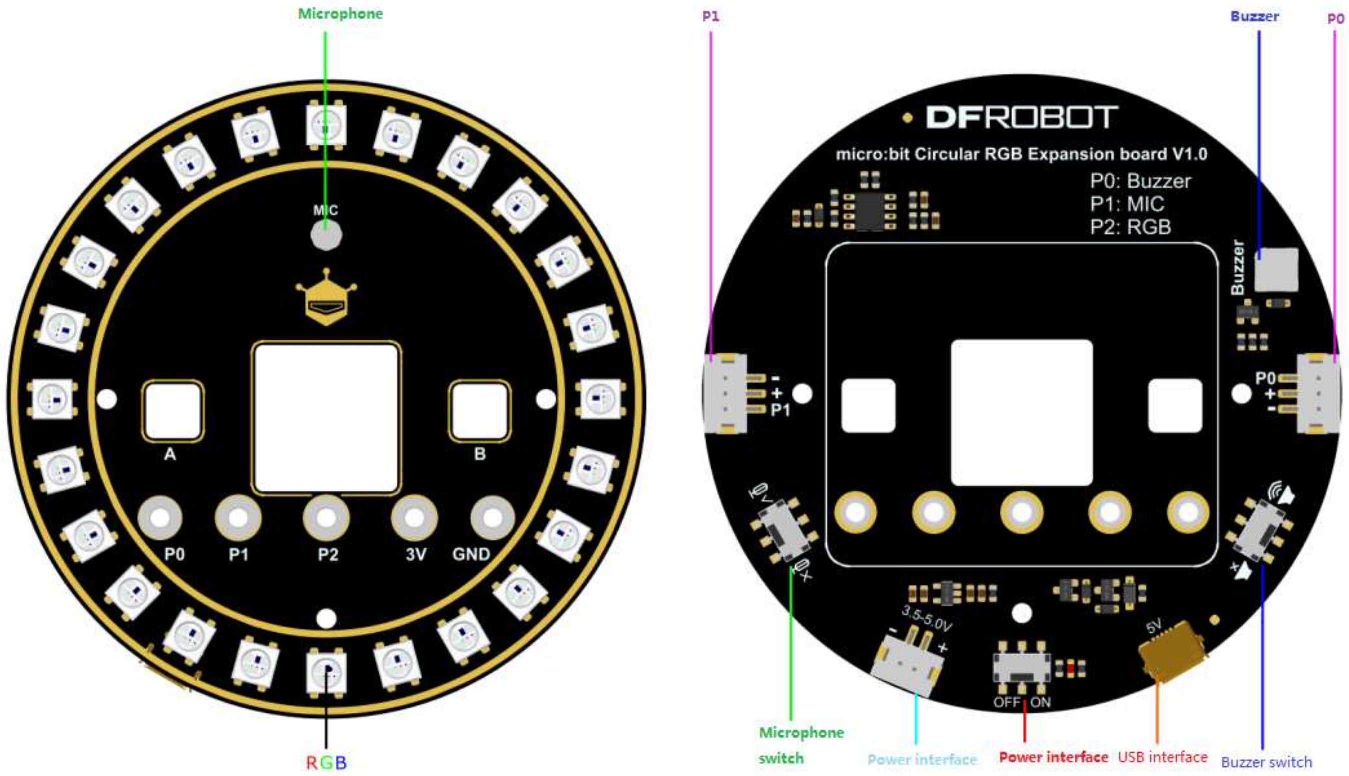
Features

- Support USB interface power supply and direct use of power-bank power supply or USB computer power supply.
- Support PH2.0 interface power supply and the battery box or lithium battery power supply are both OK.
- 24 RGB single-line lights, 16 million colors free mixing
- Makecode graphical programming
- Onboard microphone and buzzer
- Leaded out P0 and P1 interfaces, and distribute with the connection line, support the boson expansion modules.
- Ultra-thin volume,more suitable for wearable and strap applications.

Specification

- Supply Voltage:3.5~5V
- WS2812 Single-line RGB LEDs x 24
- Onboard buzzer x 1
- Onboard microphone x 1
- Number of interfaces: IO expansion board(P0,P1)x2, PH2.0 Power Interface x1, USB power Interface x1

Board Overview

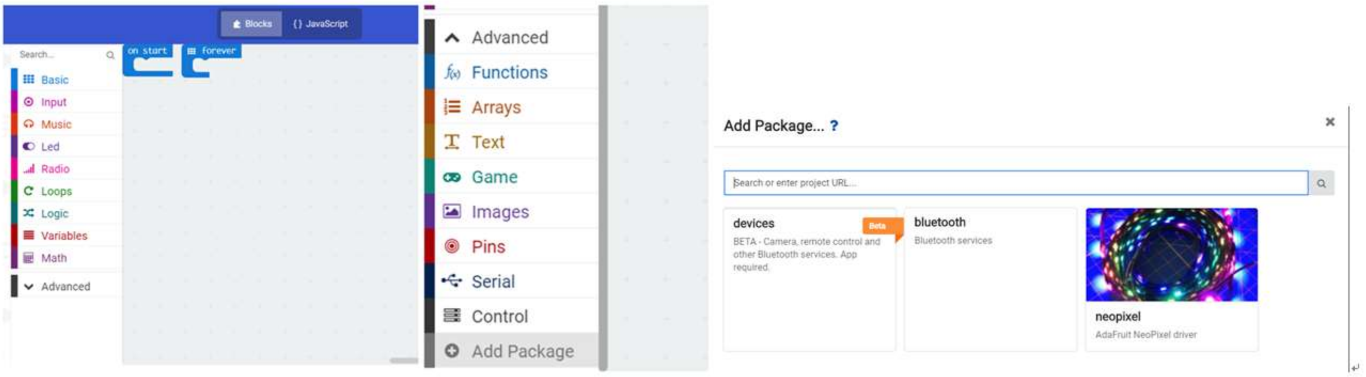


Note: After uploading the micro: bit program you need to connect the USB cable to the expansion board for power, You can also use 3.5-5.0 V power supply to power from the expansion board battery!

Tutorial

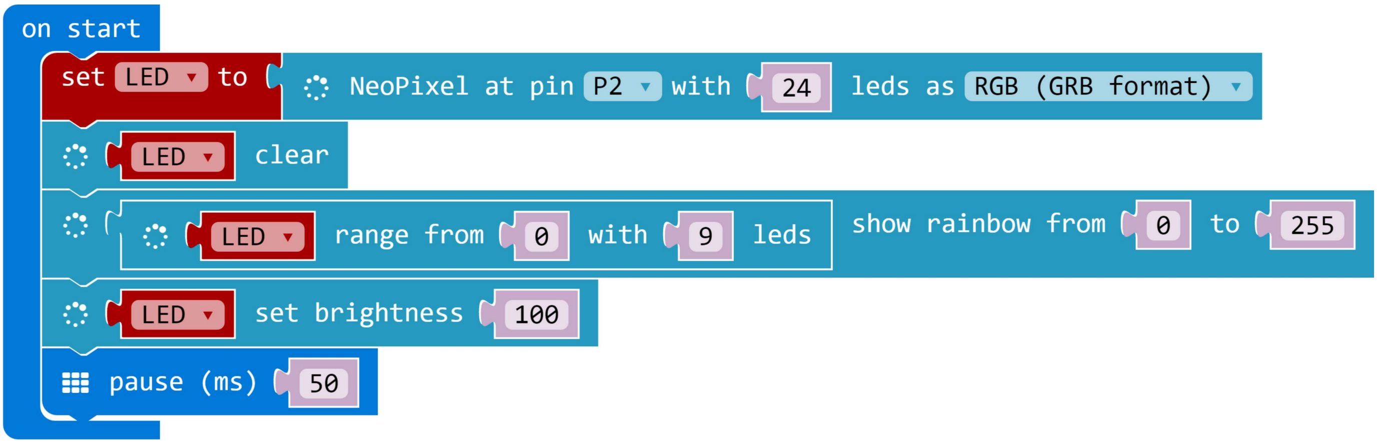
Makecode Tutorial Examples

- Click and enter the graphic programming: https://makecode.microbit.org/ (https://makecode.microbit.org/)
- Preparation work, add the **neopixel** software package, in other words, loading the lamp ring library; the steps are as follows.

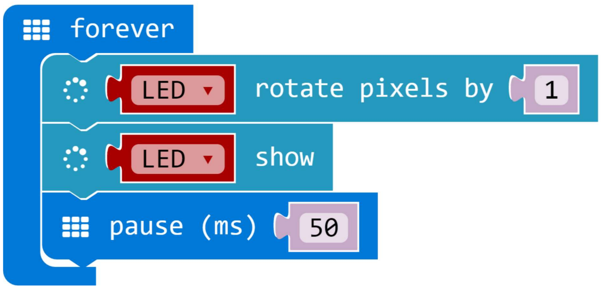


Rotated Circular Light

Click and enter the graphic programming:The Graphic Programming of Rotated Circular Light (https://makecode.microbit.org/_TPeDjDXzXfbq) '''Effect: '''The 9 RGB LEDs display 9 colors (gradients), and then on the lamp ring the nine RGB LEDs display the 9 colors in a continuous loop just like a waterfall light.

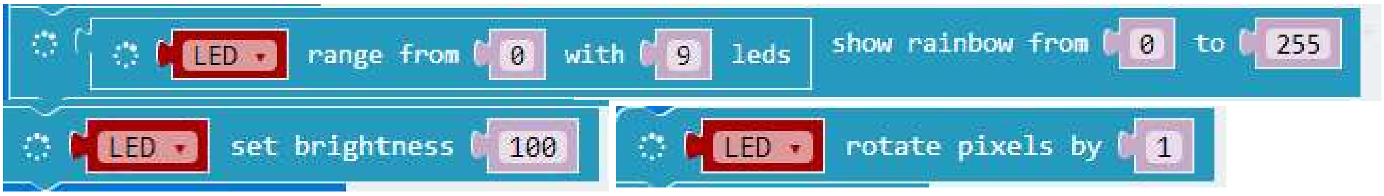


```
on start
    set LED to NeoPixel at pin P2 with 24 leds as RGB (GRB format)
    LED clear
    LED range from 0 with 9 leds show rainbow from 0 to 255
    LED set brightness 100
    pause (ms) 50
```



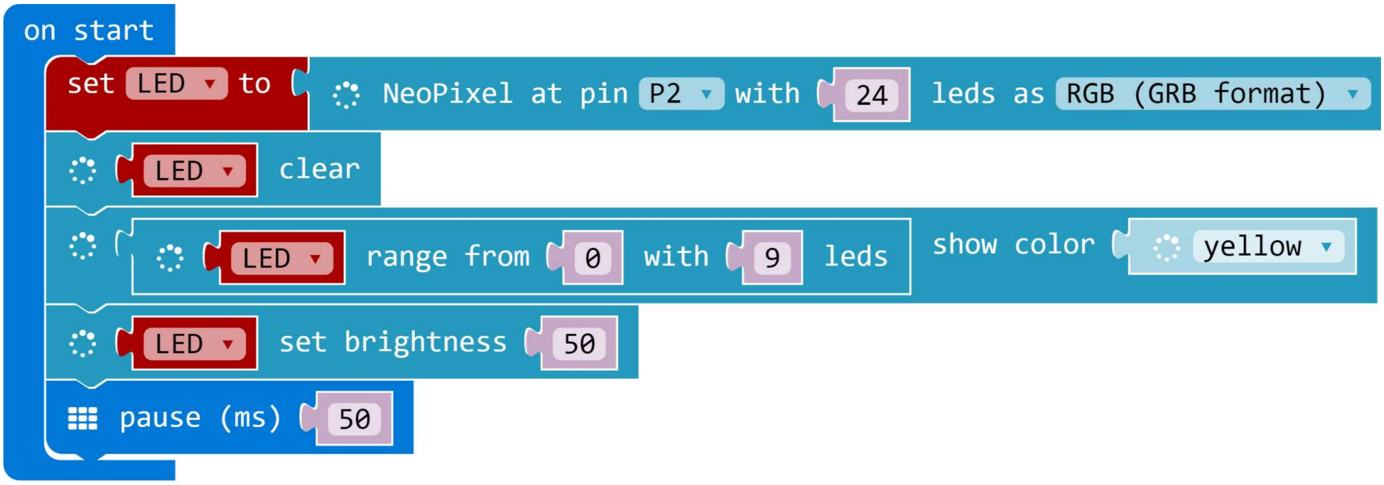
```
forever
    LED rotate pixels by 1
    LED show
    pause (ms) 50
```

Light up 9 LEDs from the No. 0 LED

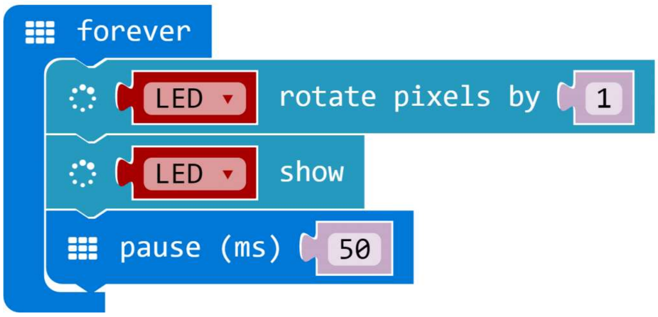


```
LED range from 0 with 9 leds show rainbow from 0 to 255
LED set brightness 100
LED rotate pixels by 1
```

Modify to solid color rotation effect Click and enter the graphic programming： Yellow Rotating Circular Light (https://makecode.microbit.org/_iEFK2b6zu62K)



```
on start
    set LED ▾ to NeoPixel at pin P2 ▾ with 24 leds as RGB (GRB format) ▾
    LED ▾ clear
    LED ▾ range from 0 with 9 leds show color yellow ▾
    LED ▾ set brightness 50
    pause (ms) 50
```

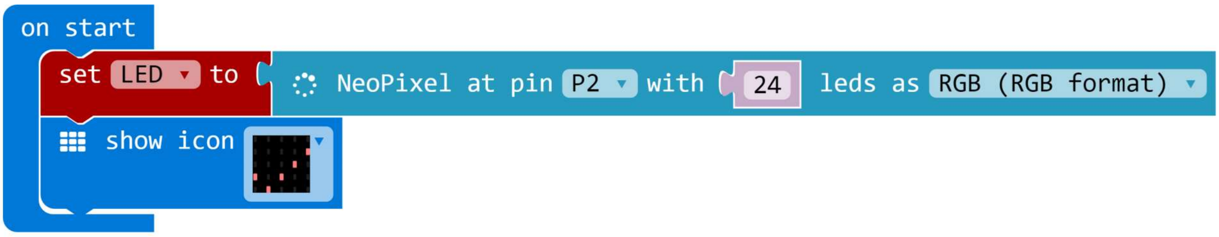


```
forever
    LED ▾ rotate pixels by 1
    LED ▾ show
    pause (ms) 50
```

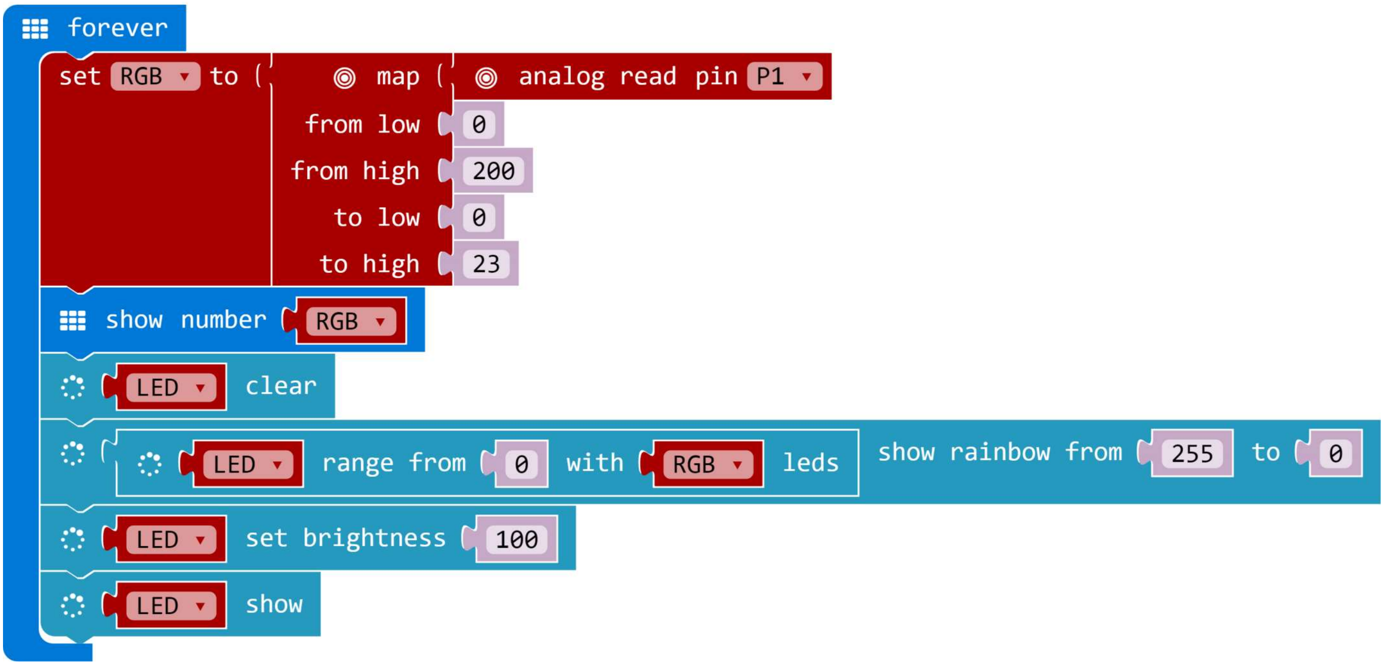
Modify the color behind the show color to get other solid color rotation effects.

Sound Control Circular Light

Click and enter the graphic programming: The Graphical Programming of Voice Control Circular Light (https://makecode.microbit.org/_LdE3ypDPYVdW) '''Effect: ''' Light up 24 RGB LEDs in sequence according to the size of the detected sound, forming a gradual pulsating light ring.



```
on start
    set LED to NeoPixel at pin P2 with 24 leds as RGB (RGB format)
    show icon
```

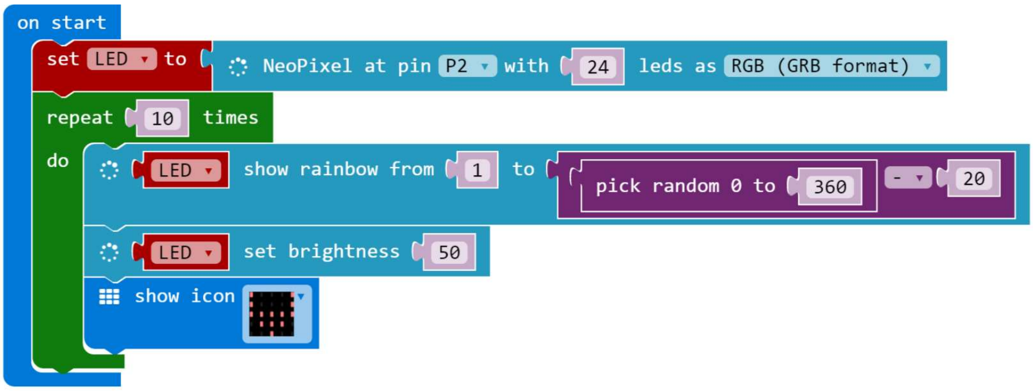


```
forever
    set RGB to map analog read pin P1
        from low 0
        from high 200
        to low 0
        to high 23
    show number RGB
    LED clear
    LED range from 0 with RGB leds show rainbow from 255 to 0
    LED set brightness 100
    LED show
```

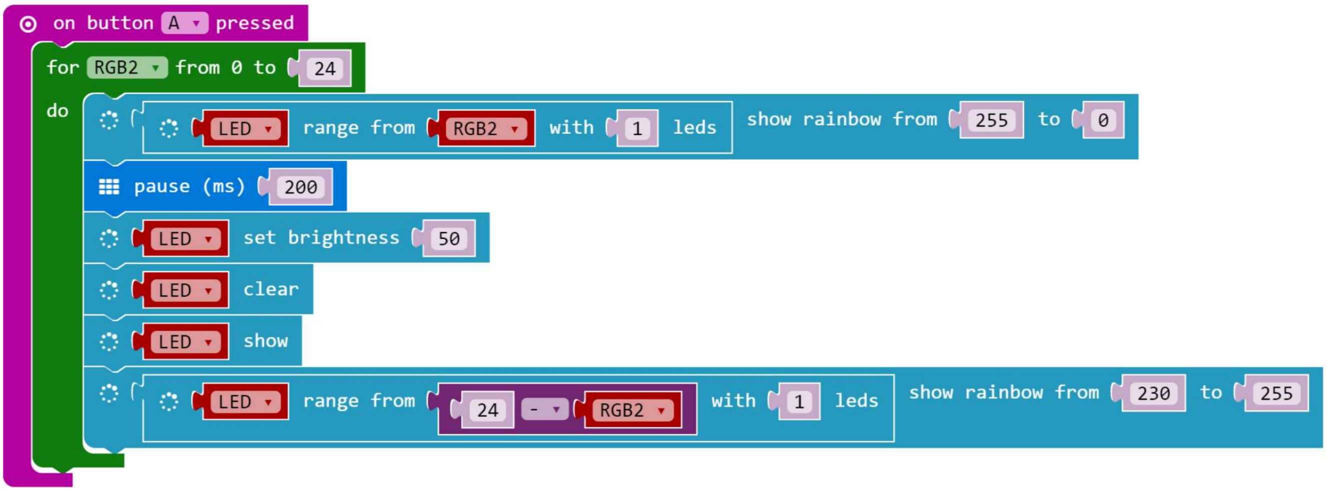
By modifying the "Map" to change the relationship between sound intensity and the number of alight leds. 0~~300 represents the range of sound; 0~~23 represents 24 RGB LEDs.

Control the Circular Light via Key A, B

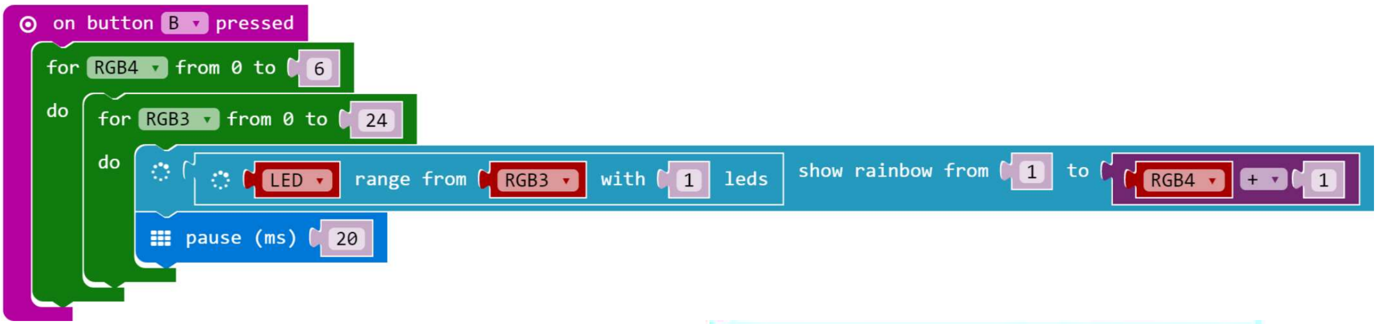
Click and enter the graphic programming: Control the Annular Light via Key A, B (https://makecode.microbit.org/_8aY7Ff5PF2cU) '''Effect: ''' Turn on the power, then 24 RGB LEDs display some colors randomly in the beginning. When key A is pressed, executing the waterfall light mode once; When B is pressed, the circular light refreshes the color in every 20ms, and there are 7 colors at all.



```
on start
    set LED to NeoPixel at pin P2 with 24 leds as RGB (GRB format)
    repeat 10 times
    do
        LED show rainbow from 1 to (pick random 0 to 360) - 20
        LED set brightness 50
        show icon
```

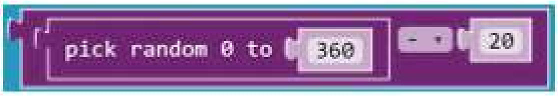


```
on button A pressed
    for RGB2 from 0 to 24
    do
        LED range from RGB2 with 1 leds show rainbow from 255 to 0
        pause (ms) 200
        LED set brightness 50
        LED clear
        LED show
        LED range from (24 - RGB2) with 1 leds show rainbow from 230 to 255
```



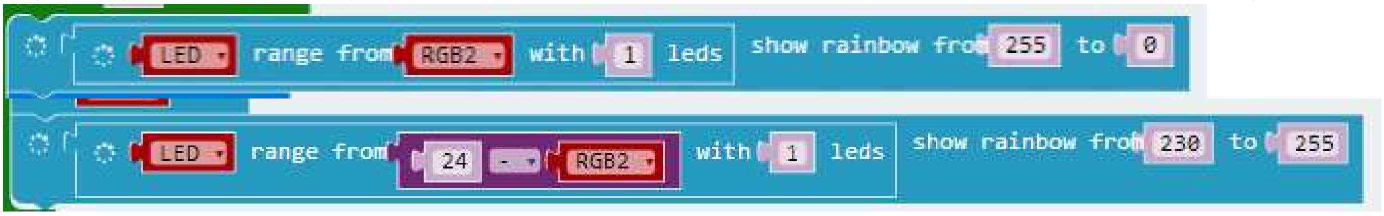
```
on button B pressed
    for RGB4 from 0 to 6
    do
        for RGB3 from 0 to 24
        do
            LED range from RGB3 with 1 leds show rainbow from 1 to RGB4 + 1
            pause (ms) 20
```

RGB LEDs display color randomly when power on.



```
(pick random 0 to 360) - 20
```

When key A is pressed, two-way waterfall light is started, that is, forward, reverse simultaneously.

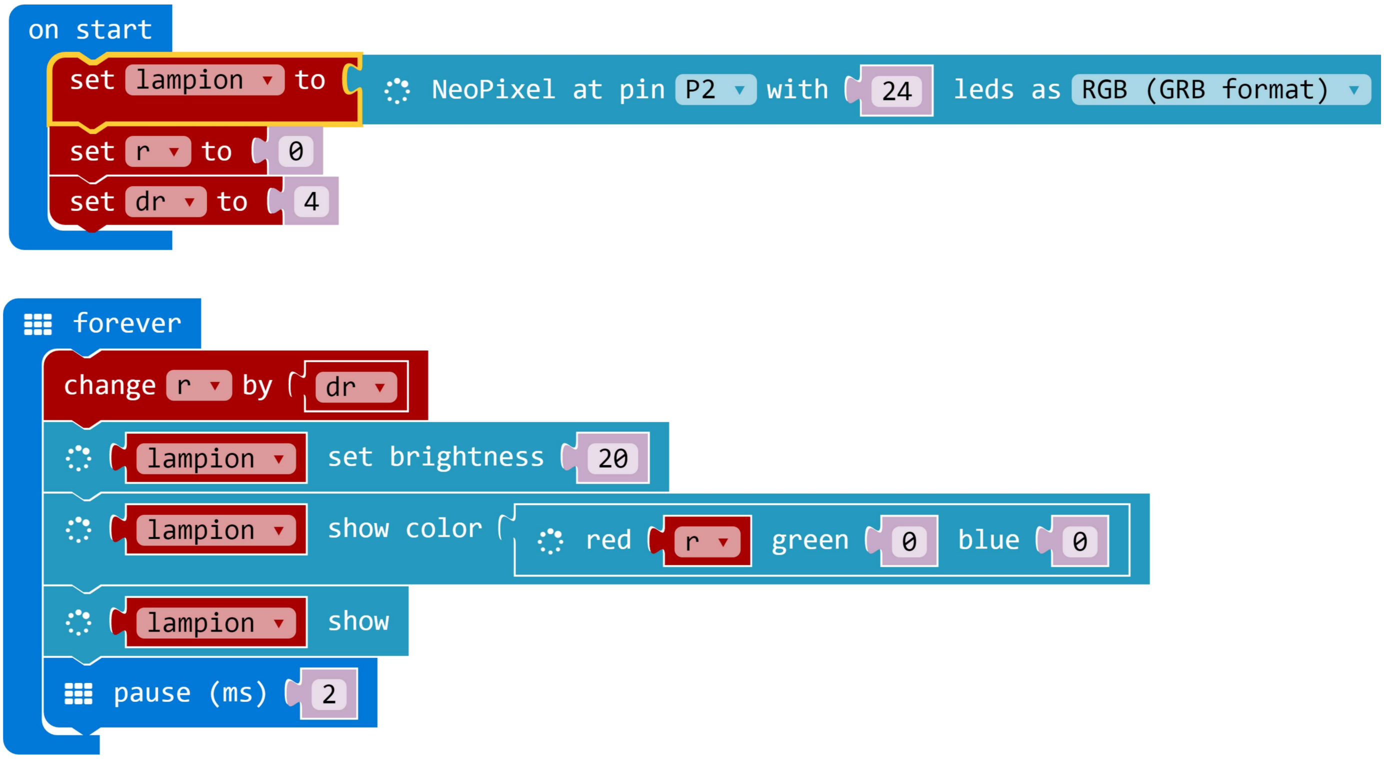


```
LED range from RGB2 with 1 leds show rainbow from 255 to 0
LED range from (24 - RGB2) with 1 leds show rainbow from 230 to 255
```

When key B is pressed, the circular light is refreshed in every 20 ms.

Breathing Light

Click and enter the graphic programming:Breathing Light (https://makecode.microbit.org/_2v53WU9T5VsR) '''Effect: ''' 24 RGB LEDs light up red at the same time, the brightness changes from weak to strong in loop, like breathing.

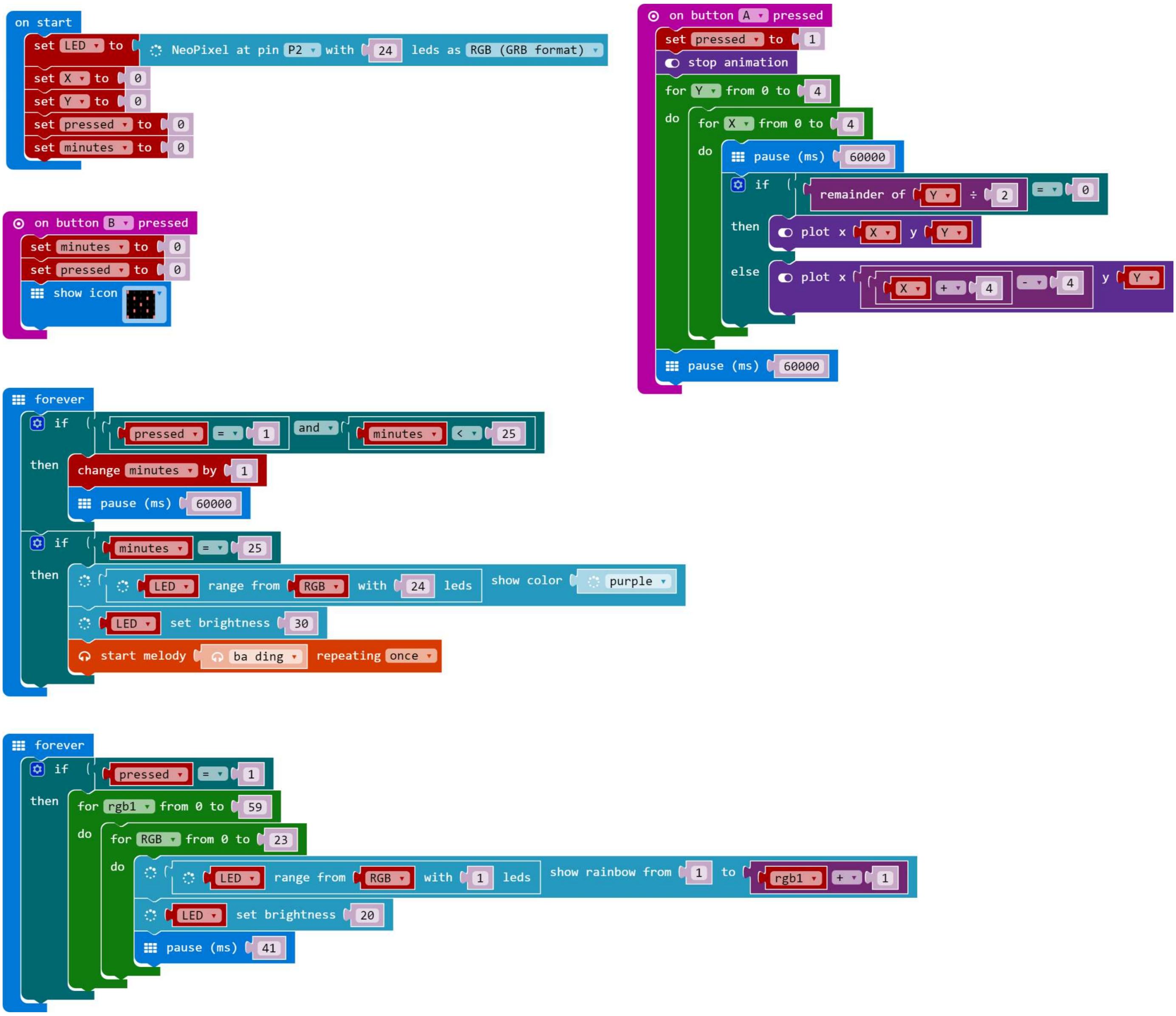


```
on start
    set lampion to NeoPixel at pin P2 with 24 leds as RGB (GRB format)
    set r to 0
    set dr to 4

forever
    change r by dr
    lampion set brightness 20
    lampion show color red r green 0 blue 0
    lampion show
    pause (ms) 2
```

Tomato Timer

The Pomodoro technique is a simple time management method. Essentially, it is to set a 25-minute work period and do only one thing in this period. So this is a 25 mins timer.

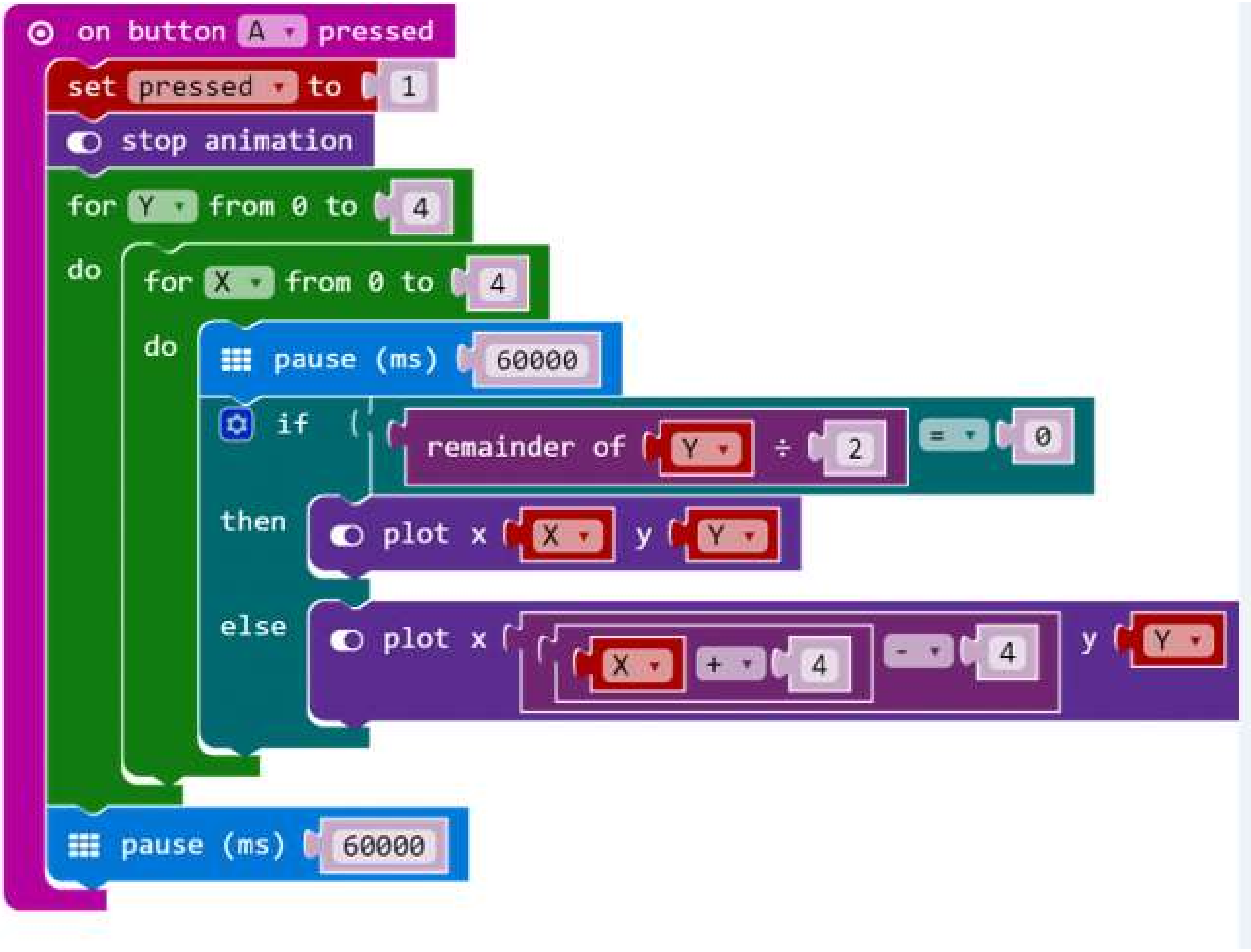
Click and enter the graphic programming:Tomato Timer (https://makecode.microbit.org/_9XTRC0aPA9jk) '''Effect: ''' Press key A to start the program and light a LED on the main board in every minute. When all LEDs are on, the buzzer beeps; When key B is pressed, stops the buzzer and stops timing. The circular light refreshes the color in every second.



```
on start
    set LED to NeoPixel at pin P2 with 24 leds as RGB (GRB format)
    set X to 0
    set Y to 0
    set pressed to 0
    set minutes to 0

on button B pressed
    set minutes to 0
    set pressed to 0
    show icon

forever
    if pressed = 1 and minutes < 25
    then
        change minutes by 1
        pause (ms) 60000
    if minutes = 25
    then
        LED range from RGB with 24 leds show color purple
        LED set brightness 30
        start melody ba ding repeating once

forever
    if pressed = 1
    then
        for rgb1 from 0 to 59
        do
            for RGB from 0 to 23
            do
                LED range from RGB with 1 leds show rainbow from 1 to rgb1 + 1
                LED set brightness 20
                pause (ms) 41

on button A pressed
    set pressed to 1
    stop animation
    for Y from 0 to 4
    do
        for X from 0 to 4
        do
            pause (ms) 60000
            if remainder of Y ÷ 2 = 0
            then
                plot x X y Y
            else
                plot x X + 4 - 4 y Y
    pause (ms) 60000
```

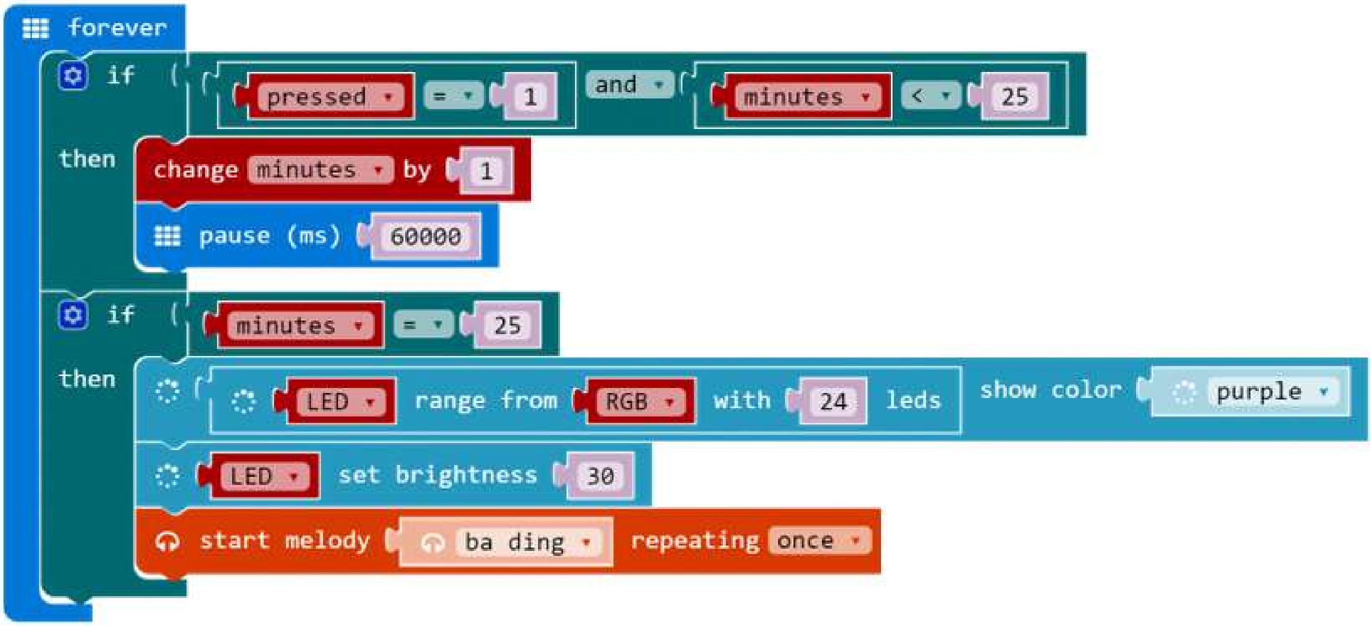
Execution Process: Firstly, define some variables. Such as "X", "Y", "pressed", "minutes". Where "X" and "Y" are the LED dot matrix coordinates of the micro:bit board.

Turn on the leds



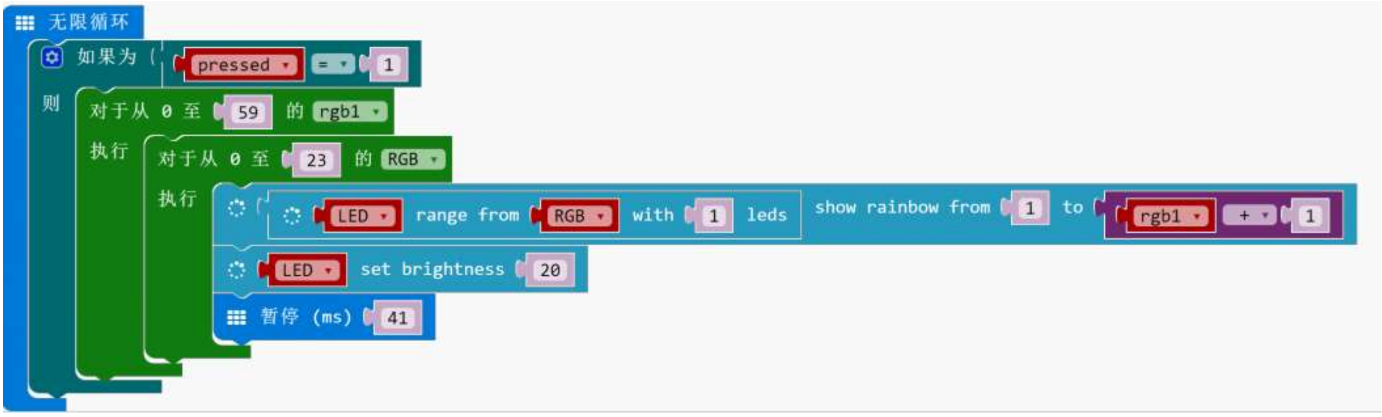
```
on button A pressed
    set pressed to 1
    stop animation
    for Y from 0 to 4
    do
        for X from 0 to 4
        do
            pause (ms) 60000
            if remainder of Y ÷ 2 = 0
            then
                plot x X y Y
            else
                plot x X + 4 - 4 y Y
    pause (ms) 60000
```

Set Time Minutes<25;minutes 1; When minutes=25, the buzzer rings;



```
forever
    if pressed = 1 and minutes < 25
    then
        change minutes by 1
        pause (ms) 60000
    if minutes = 25
    then
        LED range from RGB with 24 leds show color purple
        LED set brightness 30
        start melody ba ding repeating once
```

Set the effect of circular light When key A is pressed, start the circular light program; refresh the color in every second.



```
无限循环
  如果为 ( pressed = 1
  则
    对于从 0 至 59 的 rgb1
    执行
      对于从 0 至 23 的 RGB
      执行
        ( LED range from RGB with 1 leds show rainbow from 1 to rgb1 + 1
        LED set brightness 20
        暂停 (ms) 41
```

Calculation formula for the time interval between each RGB LED: 6000ms (1min) / 24 (24 RGB LEDs) / 60 (repeat 60 times) ≈41ms.

FAQ

Q: Why sometimes the light is partially lighted/ the brightness is low when the sample code is uploaded? A: The light ring requires a high power supply. So you need to connect the USB cable or the external battery to power port(USB/ external battery) of the expansion board.

More Documents

- Specification Diagram (https://www.dfrobot.com.cn/images/upload/File/201806201734133r7ki0.pdf)

Get **Micro:bit Circular RGB LED Expansion Board** (https://www.dfrobot.com/product-1748.html) from DFRobot Store or **DFRobot Distributor**. (https://www.dfrobot.com/index.php?route=information/distributorslogo)

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