10.Magnetometer

Learning goals: Read the data from the on board magnetometer and light a RGB of matrix pointing to the North.

Experimental phenomena: After running the program, , the RGB matrix will light a light pointing to the North. When we turn the sense_HAT expansion board, the indicator RGB will always point to the North.

Tips:
The magnetometer is also called geomagnetic and magnetic sensor. It can be used to test the strength and direction of the magnetic field. The orientation of the positioning device can be regarded as a huge magnet. The principle of the magnetometer is similar to that of the compass. It can be measured. The angle between the current equipment and the East, South, West, and North directions.

1.Create python file
nano compass.py

We need to input content as shown below:

```
#!/usr/bin/python
from sense_hat import SenseHat

# To get good results with the magnetometer you must first calibrate it using
# the program in RTIMULib/Linux/RTIMULibCal
# The calibration program will produce the file RTIMULib.ini
# Copy it into the same folder as your Python code

# Outer ring RGB light on matrix
led_loop = [4, 5, 6, 7, 15, 23, 31, 39, 47, 55, 63, 62, 61, 60, 59, 58, 57, 56, 48,
40, 32, 24, 16, 8, 0, 1, 2, 3]

sense = SenseHat()
sense.set_rotation(0)
sense.clear()
prev_x = 0
prev_y = 0

# RGB lamp angle ratio
led_degree_ratio = len(led_loop) / 360.0
while True:
    # Read magnetometer data
    dir = sense.get_compass()
```

```
# Calculate the angular deviation
dir_inverted = 360 - dir    # So LED appears to follow North
led_index = int(led_degree_ratio * dir_inverted)
offset = led_loop[led_index]
y = offset // 8    # row
x = offset % 8    # column
```

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    # Calculate the angular deviation
    dir_inverted = 360 - dir  # So LED appears to follow North
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    offset = led_loop[led_index]

    y = offset // 8  # row
    x = offset % 8  # column

    # If the position change occurs, the last displayed light is extinguished.
    if x != prev_x or y != prev_y:
        sense.set_pixel(prev_x, prev_y, 0, 0, 0)

    sense.set_pixel(x, y, 0, 0, 255)

    prev_x = x
    prev_y = y
```

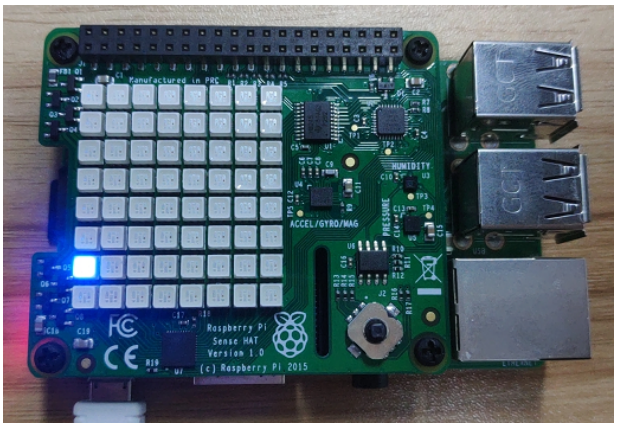
Please press Ctrl+O to save, press Ctrl+X to quit.
The code of the experiment, please refer to **compass.py** in the Python sample program folder.

3.Running program

Input the following command to running:
python compass.py

After running the program, the RGB matrix will light up a RGB lamp, when we rotate the sense_HAT expansion board, and the indicator will change position.
Exit: Ctrl+C

```
pi@raspberrypi:~/sense_hat $ nano compass.py
pi@raspberrypi:~/sense_hat $ python compass.py
```


Manufactured in PRC
HUMIDITY
ACCEL/GYRO/MAG
PRESSURE
Raspberry Pi
Sense HAT
Version 1.0
(c) Raspberry Pi 2015