

## 9. Get Gyroscope data

**Learning goals:** Read the data detected by the on board gyroscope.

**Experimental phenomena:** After running the program, the current position is (0,0,0), and the expansion board can be rotated in three different directions: x-axis, y-axis, and z-axis. The terminal will print different angle values and output value range (0,360).

### Tips:

The working principle of the gyroscope: The screw is a device for sensing and maintaining the direction. It is designed based on the theory of conservation of angular momentum.

The gyroscope is mainly composed of a rotor that is located at the axis and rotatable. Once the gyroscope starts to rotate, the gyroscope has a tendency to resist the change of direction due to the angular momentum of the rotor. Gyros are often used in navigation, positioning and other systems commonly used examples such as mobile phone GPS positioning navigation, satellite three-axis gyroscope positioning.

### 1. Create python file

#### nano gyroscope.py

We need to input content as shown below:

```
#!/usr/bin/python
from sense_hat import SenseHat
import time
sense = SenseHat()
```

```
# imu setting (compass_enabled, gyro_enabled, accel_enabled)
# The following settings only turn on gyroscope test data, you need to turn off
the magnetometer and accelerometer
```

```
sense.set_imu_config(False, True, False)
while True:
```

```
    # Obtain gyroscope raw xyz axis data
    # raw = sense.gyro_raw
    # raw = sense.gyroscope_raw
    # raw = sense.get_gyroscope_raw()
```

```
    # Read radians value of imu Chip, roll->x, pitch->y, yaw->z
    # Need to match the set_imu_config settings, the content displayed
    # gyr_radians = sense.orientation_radians
```

```

# gyr_radians = sense.get_orientation_radians()

# Read the angle of the imu chip, set_imu_config modify the settings
# gyr_degrees = sense.orientation
# gyr_degrees = sense.get_orientation()

# The angle of the read-only gyroscope, starting at each start position
(0,0,0)
# gyr_degrees = sense.gyro
# gyr_degrees = sense.gyroscope
gyr_degrees = sense.get_gyroscope()

# Print data
# print("x: {x}, y: {y}, z: {z}".format(**raw))
    print("p_deg: {pitch}, r_deg: {roll}, y_deg:
{yaw}".format(**gyr_degrees))
    # print("p_rad: {pitch}, r_rad: {roll}, y_rad:
{yaw}".format(**gyr_radians))
    # Delay 0.2 seconds to avoid sending too fast
    time.sleep(0.2)

```

```

1  #!/usr/bin/python
2  from sense_hat import SenseHat
3  import time
4
5  sense = SenseHat()
6
7  # imu setting (compass_enabled, gyro_enabled, accel_enabled)
8  # The following settings only turn on gyroscope test data,
9  # you need to turn off the magnetometer and accelerometer
10 sense.set_imu_config(False, True, False)
11
12 while True:
13     # Obtain gyroscope raw xyz axis data
14     # raw = sense.gyro_raw
15     # raw = sense.gyroscope_raw
16     # raw = sense.get_gyroscope_raw()
17
18     # Read radians value of imu Chip, roll->x, pitch->y, yaw->z
19     # Need to match the set_imu_config settings, the content displayed
20     # gyr_radians = sense.orientation_radians
21     # gyr_radians = sense.get_orientation_radians()
22
23     # Read the angle of the imu chip, set_imu_config modify the settings
24     # gyr_degrees = sense.orientation
25     # gyr_degrees = sense.get_orientation()
26
27     # The angle of the read-only gyroscope, starting at each start position (0,0,0)
28     # gyr_degrees = sense.gyro
29     # gyr_degrees = sense.gyroscope
30     gyr_degrees = sense.get_gyroscope()
31
32     # Print data
33     # print("x: {x}, y: {y}, z: {z}".format(**raw))
34     print("p_deg: {pitch}, r_deg: {roll}, y_deg: {yaw}".format(**gyr_degrees))
35     # print("p_rad: {pitch}, r_rad: {roll}, y_rad: {yaw}".format(**gyr_radians))
36
37     # Delay 0.2 seconds to avoid sending too fast
38     time.sleep(0.2)

```

Please press **Ctrl+O** to save, press **Ctrl+X** to quit.

The code of the experiment, please refer to **gyroscope.py** in the Python sample program folder.

## 2.Commonly function

①Set the sensor switch of the imu chip, magnetometer, gyroscope, accelerometer, (compass\_enabled, gyro\_enabled, accel\_enabled)

```
# imu setting (compass_enabled, gyro_enabled, accel_enabled)
# The following settings only turn on gyroscope test data,
# you need to turn off the magnetometer and accelerometer
sense.set_imu_config(False, True, False)
```

②Obtain gyroscope raw xyz axis data

```
# Obtain gyroscope raw xyz axis data
# raw = sense.gyro_raw
# raw = sense.gyroscope_raw
# raw = sense.get_gyroscope_raw()
```

③A variety of ways to read the angle data and radians data of the gyroscope.

```
# Read radians value of imu Chip,roll->x, pitch->y, yaw->z
# Need to match the set_imu_config settings, the content displayed
# gyr_radians = sense.orientation_radians
# gyr_radians = sense.get_orientation_radians()

# Read the angle of the imu chip, set_imu_config modify the settings
# gyr_degrees = sense.orientation
# gyr_degrees = sense.get_orientation()

# The angle of the read-only gyroscope, starting at each start position (0,0,0)
# gyr_degrees = sense.gyro
# gyr_degrees = sense.gyroscope
gyr_degrees = sense.get_gyroscope()
```

④Print out data

```
# Print data
# print("x: {x}, y: {y}, z: {z}".format(**raw))
print("p_deg: {pitch}, r_deg: {roll}, y_deg: {yaw}".format(**gyr_degrees))
# print("p_rad: {pitch}, r_rad: {roll}, y_rad: {yaw}".format(**gyr_radians))
```

## 3.Running program

Input the following command to running:

**python gyroscope.py**

After running the program, the angle data detected by the gyroscope will be printed on the terminal.

r\_deg: roll angle, p\_deg: pitch angle, y\_deg: yaw angle.

Changing the angle of sens\_HAT expansion board will output a different value.

```
pi@raspberrypi:~/sense_hat $ nano gyroscope.py
pi@raspberrypi:~/sense_hat $ python gyroscope.py
r_deg: 0.0, p_deg: 0.0, y_deg: 0.0
r_deg: 359.97003936186553, p_deg: 359.9771324599577, y_deg: 0.021324736045432464
r_deg: 359.9478793233666, p_deg: 359.9546426447178, y_deg: 0.024057845579962323
r_deg: 359.92244356216025, p_deg: 359.947129513337, y_deg: 0.026737485872369023
r_deg: 359.88650189278826, p_deg: 359.9287800033585, y_deg: 0.01844785236289516
r_deg: 359.88018394112555, p_deg: 359.90281341172266, y_deg: 0.02133735421961447
r_deg: 359.82525741410996, p_deg: 359.8772665698959, y_deg: 0.02794115997123832
r_deg: 359.823664459249, p_deg: 359.86718338307173, y_deg: 0.049383308235823556
r_deg: 359.7996748071715, p_deg: 359.8646922049741, y_deg: 0.04796778488087147
```

