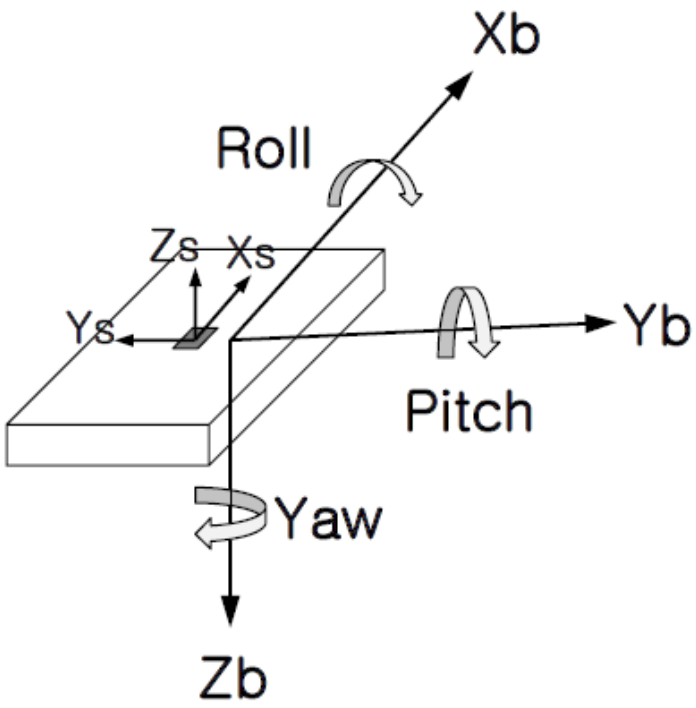
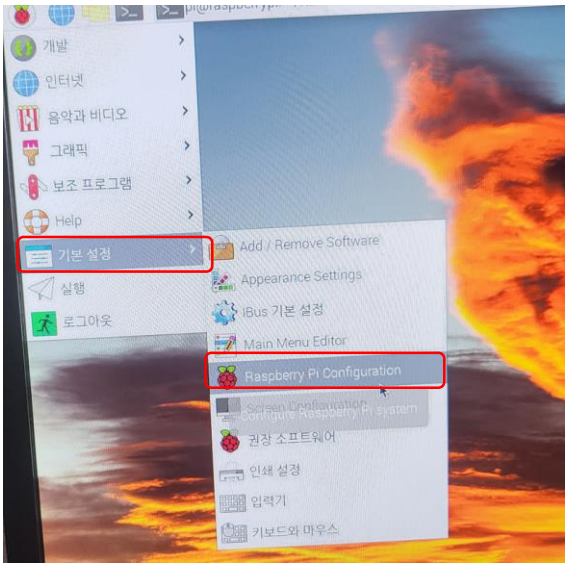
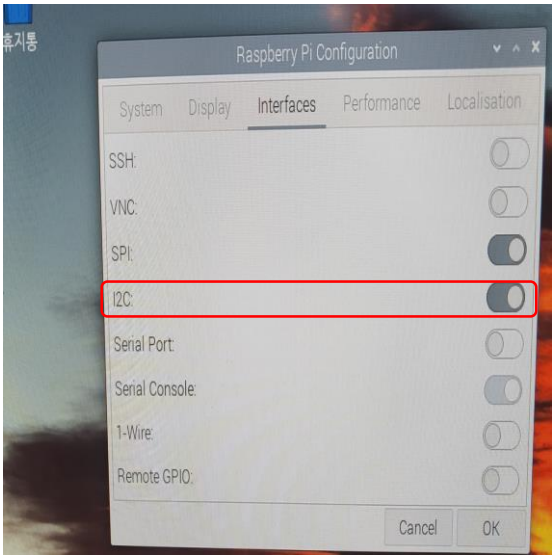
1. 자이로센서 (교재 p. 434, ch9)



*** i2c 디바이스 설정 (교재 p.321, ch6)**

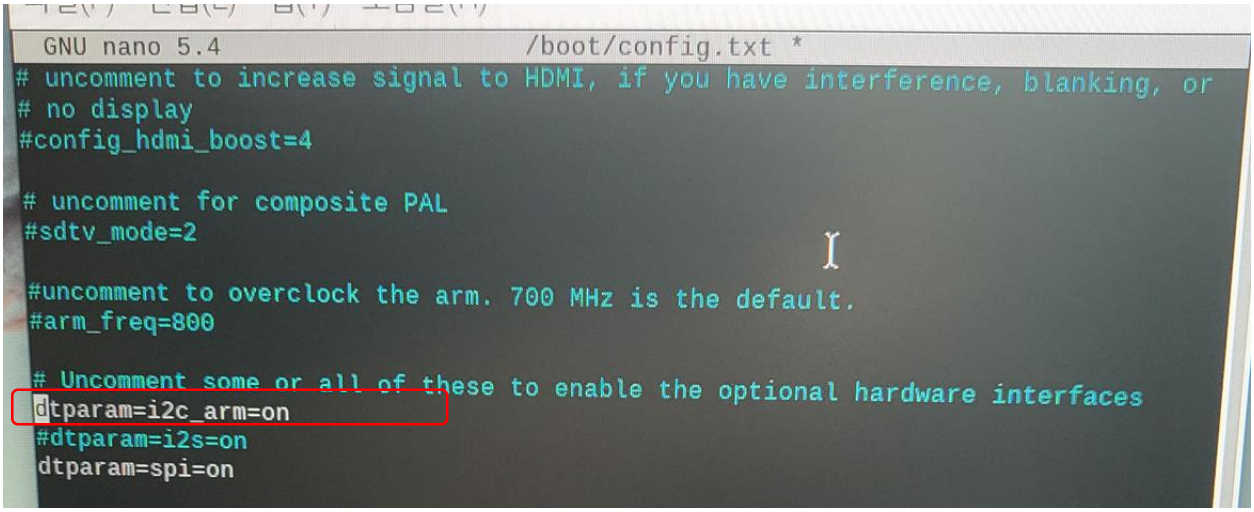
$ sudo raspi-config 또는 다음과 같이 설정



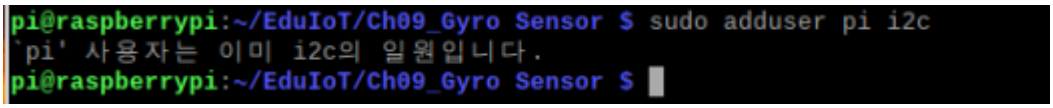


$ sudo nano /boot/config.txt

(dtparam=i2c_arm=on 이렇게 체크되어 있는지 확인)

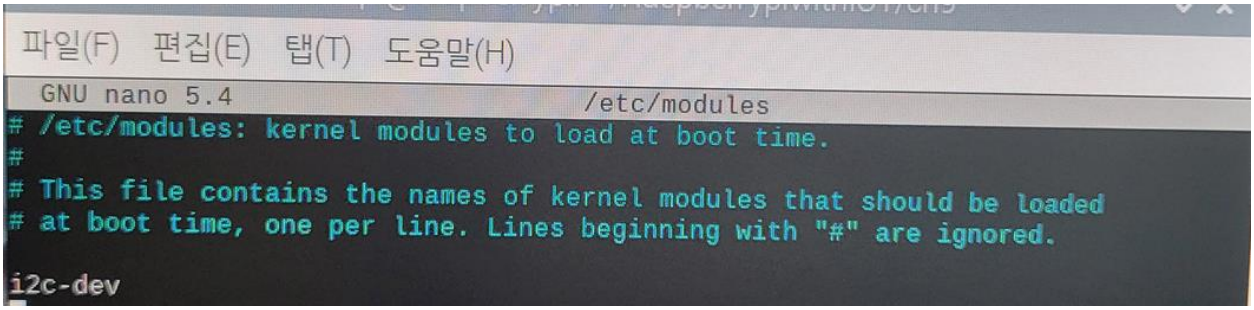


$ sudo adduser pi i2c

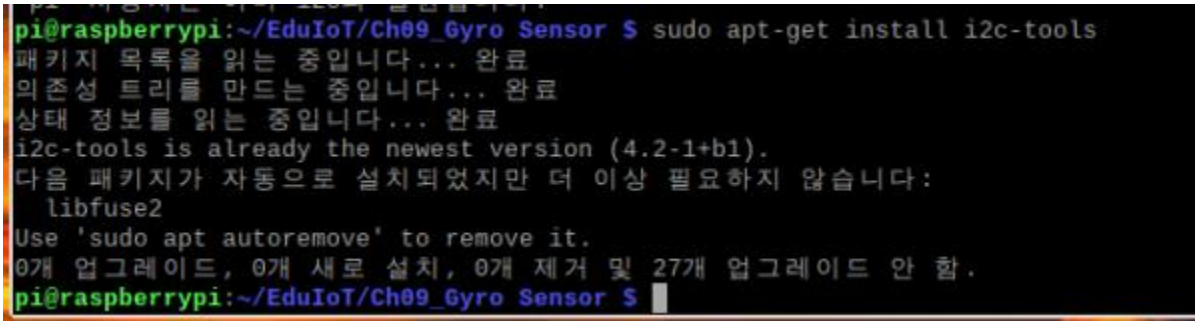


$ sudo nano /etc/modules

(i2c-dev 추가)



$ sudo apt-get install i2c-tools



$ sudo apt-get install python3-smbus

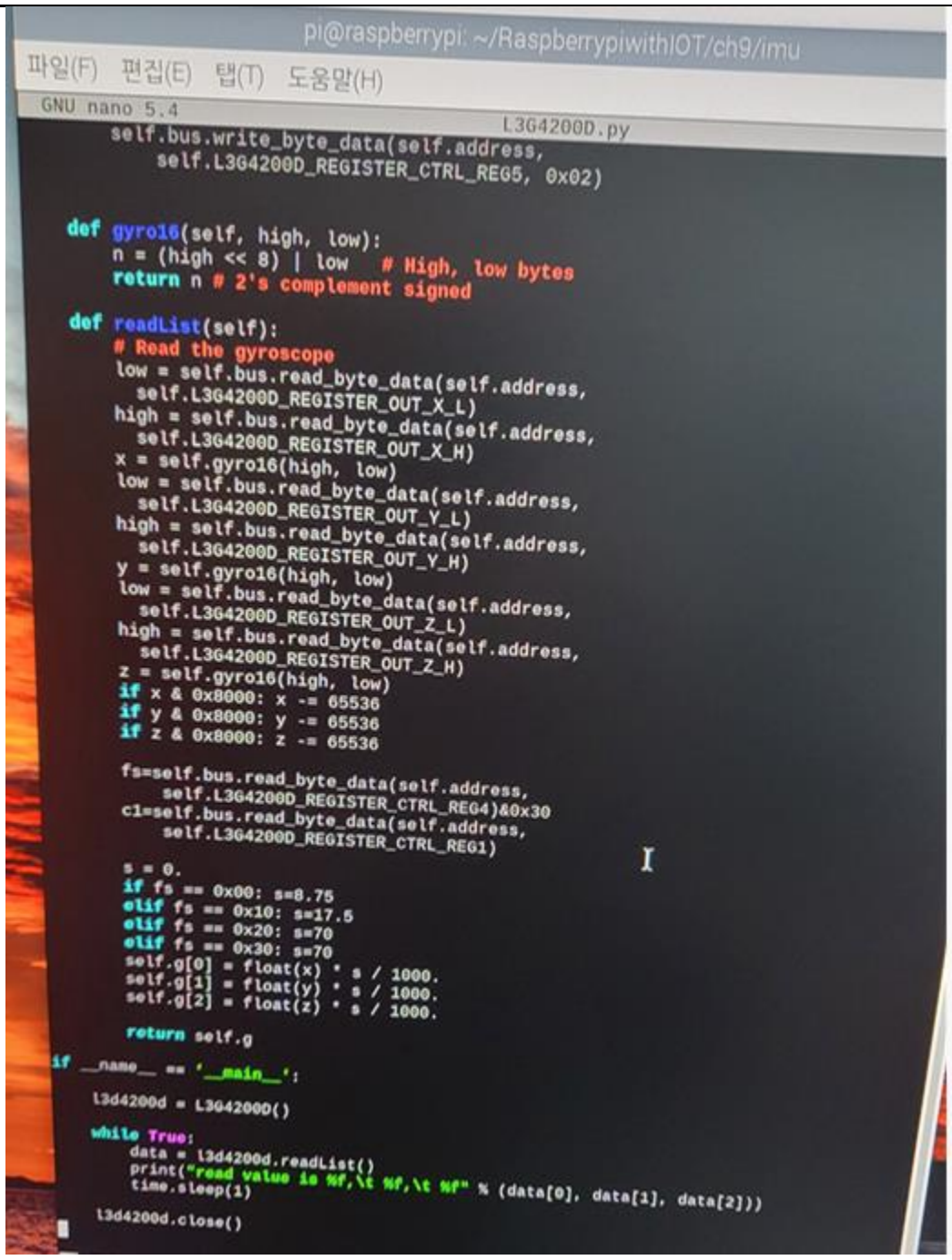
```
pi@raspberrypi:~/EduIoT/Ch09_Gyro Sensor $ sudo apt-get install python3-smbus
패키지 목록을 읽는 중입니다... 완료
의존성 트리를 만드는 중입니다... 완료
상태 정보를 읽는 중입니다... 완료
python3-smbus is already the newest version (4.2-1+b1).
다음 패키지가 자동으로 설치되었지만 더 이상 필요하지 않습니다:
  libfuse2
Use 'sudo apt autoremove' to remove it.
0개 업그레이드, 0개 새로 설치, 0개 제거 및 27개 업그레이드 안 함.
pi@raspberrypi:~/EduIoT/Ch09_Gyro Sensor $
```

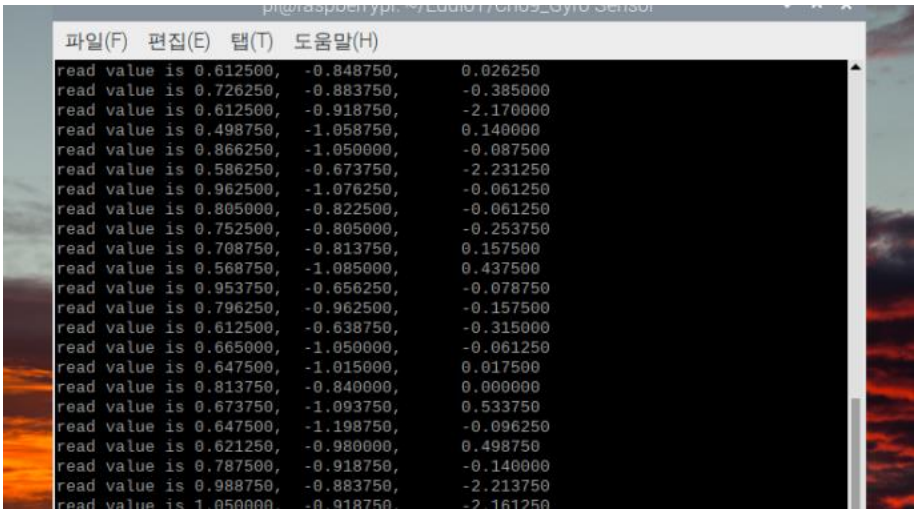
$ sudo i2cdetect –y 1

```
pi@raspberrypi:~/EduIoT/Ch09_Gyro Sensor $ sudo i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:                         -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- 69 -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
pi@raspberrypi:~/EduIoT/Ch09_Gyro Sensor $
```

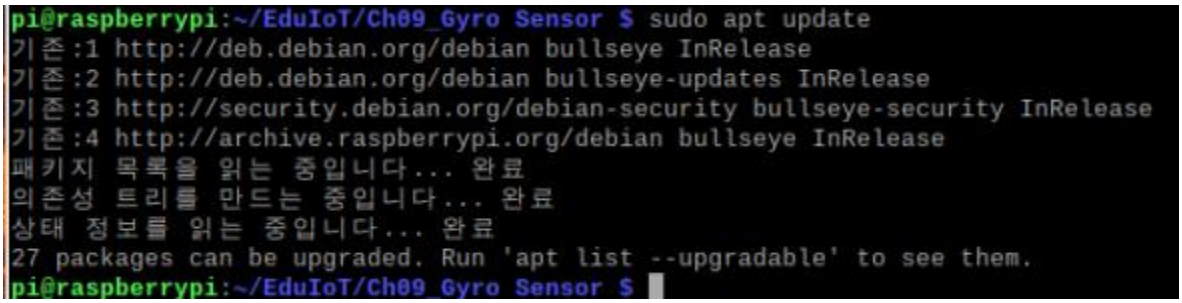
$ python3 L3G4200D.py

```
  GNU nano 5.4                                L3G4200D.py
#!/usr/bin/python3
import smbus
import time

class L3G4200D(object):

    # Minimal constants carried over from Arduino library
    L3G4200D_ADDRESS = 0x69   #t0110100x
    address = L3G4200D_ADDRESS

    L3G4200D_REGISTER_WHO_AM_I = 0x0F
    L3G4200D_REGISTER_CTRL_REG1 = 0x20
    L3G4200D_REGISTER_CTRL_REG2 = 0x21
    L3G4200D_REGISTER_CTRL_REG3 = 0x22
    L3G4200D_REGISTER_CTRL_REG4 = 0x23
    L3G4200D_REGISTER_CTRL_REG5 = 0x24
    L3G4200D_REGISTER_OUT_X_L = 0x28
    L3G4200D_REGISTER_OUT_X_H = 0x29
    L3G4200D_REGISTER_OUT_Y_L = 0x2A
    L3G4200D_REGISTER_OUT_Y_H = 0x2B
    L3G4200D_REGISTER_OUT_Z_L = 0x2C
    L3G4200D_REGISTER_OUT_Z_H = 0x2D

    g = [0., 0., 0.]

    def __init__(self, debug=False, hires=False):

        # addresses, so invoke a separate I2C instance for each
        self.bus = smbus.SMBus(1)  # if rev 1, use SMBus(0)

        if self.bus.read_byte_data(self.address,
                self.L3G4200D_REGISTER_WHO_AM_I)&0xFF is not 0xD3:
            print("error")
        # Enable x, y, z and bandwidth 800Hz, cutoff 30Hz and turn off power down
        self.bus.write_byte_data(self.address,
                self.L3G4200D_REGISTER_CTRL_REG1, 0xCF)
        # adjust/use the HPF cutoff 30Hz
        self.bus.write_byte_data(self.address,
                self.L3G4200D_REGISTER_CTRL_REG2, 0x01)
        # No interrupts used on INT1, Data Ready on INT2
        self.bus.write_byte_data(self.address,
                self.L3G4200D_REGISTER_CTRL_REG3, 0x08)
        # full-scale range
        self.bus.write_byte_data(self.address,
                self.L3G4200D_REGISTER_CTRL_REG4, 0x00)
        # output selection
        self.bus.write_byte_data(self.address,
                self.L3G4200D_REGISTER_CTRL_REG5, 0x02)
```

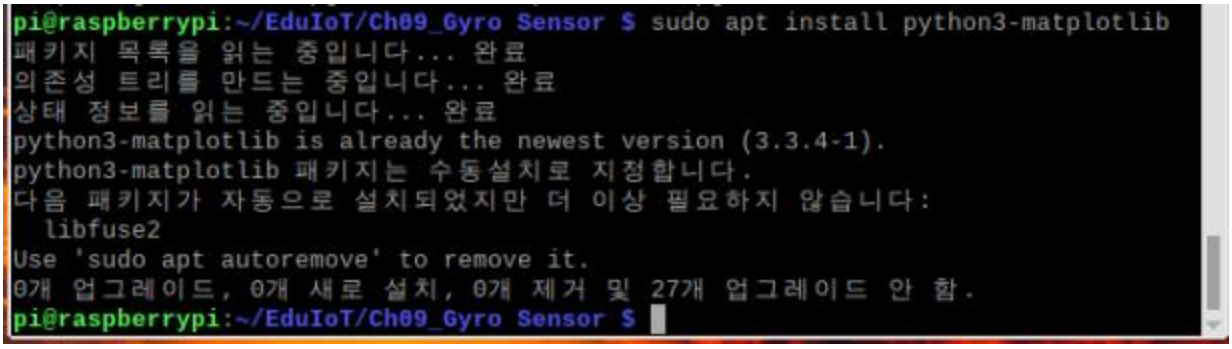

pi@raspberrypi: ~/RaspberrypiwithIOT/ch9/imu
파일(F) 편집(E) 탭(T) 도움말(H)
GNU nano 5.4 L3G4200D.py
self.bus.write_byte_data(self.address,
self.L3G4200D_REGISTER_CTRL_REG5, 0x02)
def gyro16(self, high, low):
n = (high << 8) | low # High, low bytes
return n # 2's complement signed
def readList(self):
# Read the gyroscope
low = self.bus.read_byte_data(self.address,
self.L3G4200D_REGISTER_OUT_X_L)
high = self.bus.read_byte_data(self.address,
self.L3G4200D_REGISTER_OUT_X_H)
x = self.gyro16(high, low)
low = self.bus.read_byte_data(self.address,
self.L3G4200D_REGISTER_OUT_Y_L)
high = self.bus.read_byte_data(self.address,
self.L3G4200D_REGISTER_OUT_Y_H)
y = self.gyro16(high, low)
low = self.bus.read_byte_data(self.address,
self.L3G4200D_REGISTER_OUT_Z_L)
high = self.bus.read_byte_data(self.address,
self.L3G4200D_REGISTER_OUT_Z_H)
z = self.gyro16(high, low)
if x & 0x8000: x -= 65536
if y & 0x8000: y -= 65536
if z & 0x8000: z -= 65536
fs=self.bus.read_byte_data(self.address,
self.L3G4200D_REGISTER_CTRL_REG4)&0x30
c1=self.bus.read_byte_data(self.address,
self.L3G4200D_REGISTER_CTRL_REG1)
s = 0.
if fs == 0x00: s=8.75
elif fs == 0x10: s=17.5
elif fs == 0x20: s=70
elif fs == 0x30: s=70
self.g[0] = float(x) * s / 1000.
self.g[1] = float(y) * s / 1000.
self.g[2] = float(z) * s / 1000.
return self.g
if __name__ == '__main__':
l3d4200d = L3G4200D()
while True:
data = l3d4200d.readList()
print("read value is %f,\t %f,\t %f" % (data[0], data[1], data[2]))
time.sleep(1)
l3d4200d.close()



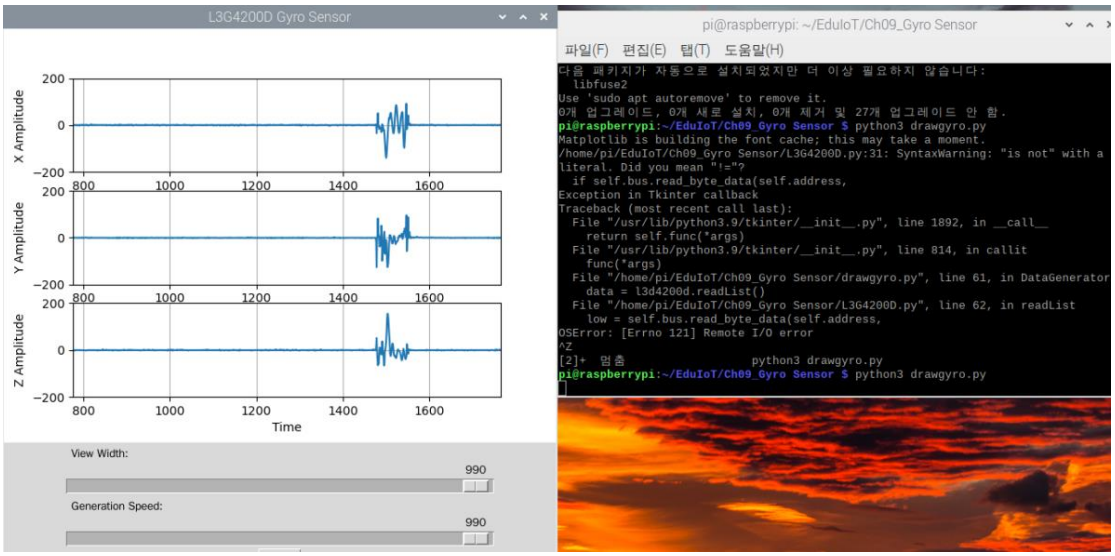
$ sudo apt update



$ sudo apt install python3-matplotlib

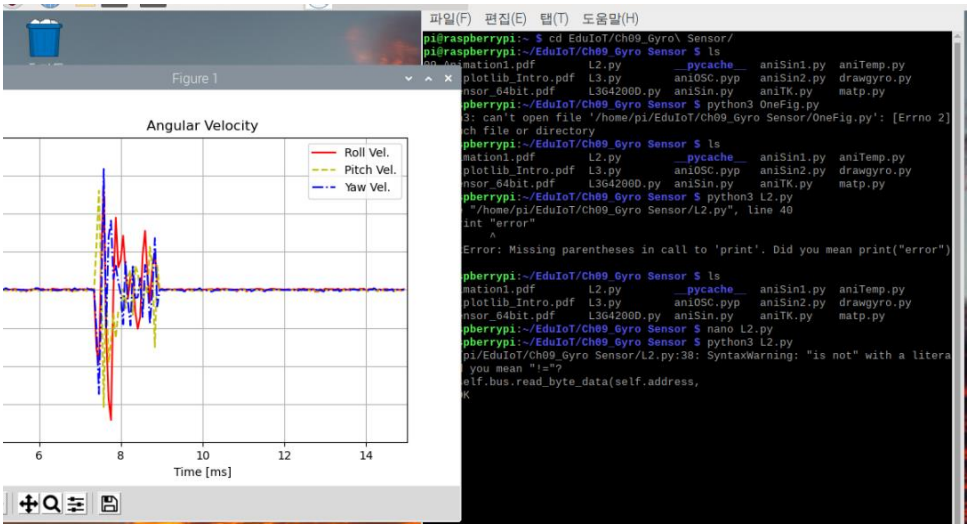


$ python3 drawgyro.py



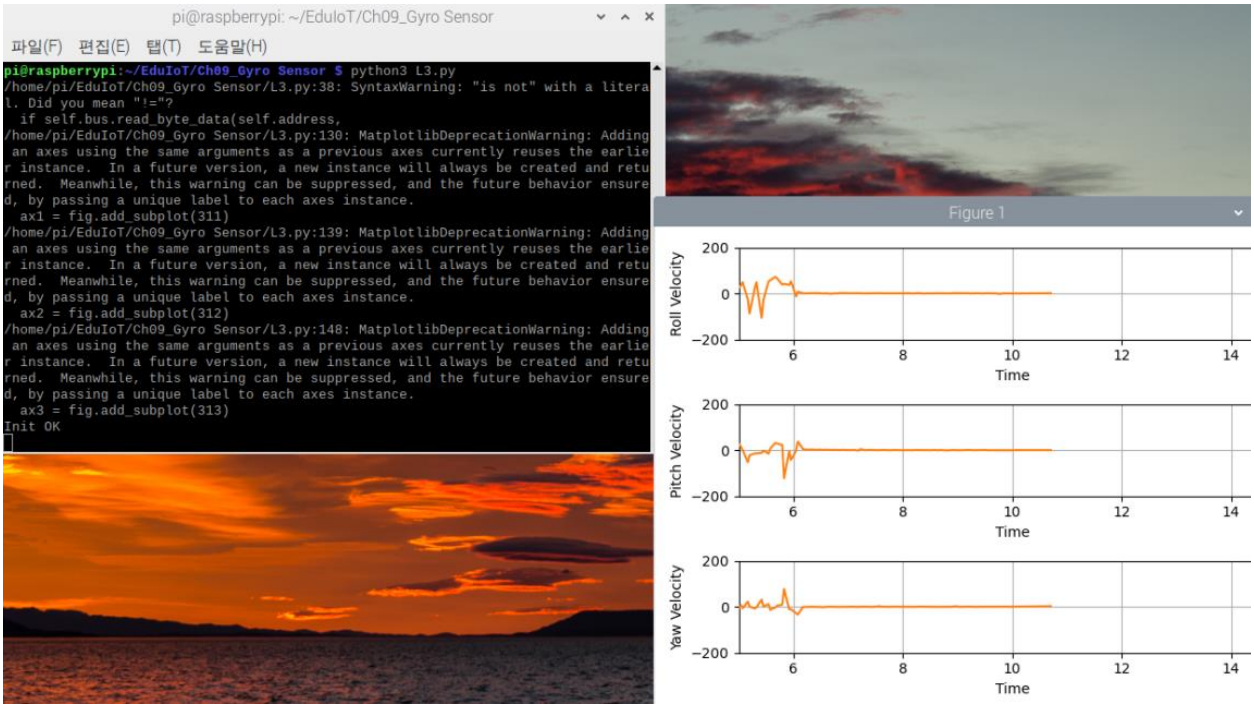
$ python3 L2.py

(print (“error”)에서 괄호 추가 후 실행)



$ python3 L3.py

(print (“error”)에서 괄호 추가 후 실행)



$ python3 aniSin1.py