

2022년 IoT기반 스마트 솔루션 개발자 양성과정



Programming : Python

18-GPIO Programming

담당 교수 : 윤 종 이

010-9577-1696

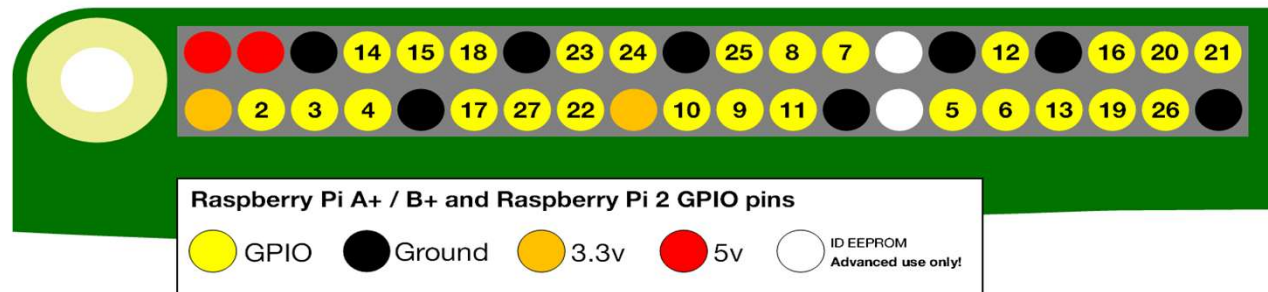
ojo1696@naver.com

<https://cafe.naver.com/yoons2022>



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General Purpose Input Output



- Voltages
 - 5V : 2pin
 - 3.3V : 2pin
- Grounds
 - 8pin
- GPIO
 - 26pin
 - High : 3V3, Low : 0V



GPIO Function

- PWM
 - Software PWM : all pins
 - Hardware PWM : GPIO12, 13, 18, 19
- SPI
 - SPI0 : MOSI(GPIO10), MISO(GPIO9), SCLK(GPIO11), CE0(GPIO(8), CE1(GPIO7)
 - SPI1 : MOSI(GPIO20), MISO(GPIO19), SCLK(GPIO21), CE0(GPIO(18), CE1(GPIO17) , CE2(GPIO16)
- I2C
 - SDA : GPIO2, SCL : GPIO3
 - EEPROM Data(GPIO0), EEPROM Clock(GPIO1)
- Serial
 - TX(GPIO14), RX(GPIO15)



\$ pinout

```

pi@raspberrypi: ~
File Edit Tabs Help

pi@raspberrypi:~$ pinout

  oooooooo000000000000 J8
  10000000000000000000
  +-----+
  | D | | SoC | | USB |
  | S | |   | | USB |
  | I | |   | | Net |
  +-----+

  pwr | HDMI | I | A |
      |      | | V |

Revision      : a02082
SoC           : BCM2837
RAM          : 1024Mb
Storage      : MicroSD
USB ports    : 4 (excluding power)
Ethernet ports : 1
Wi-fi        : True
Bluetooth    : True
Camera ports (CSI) : 1
Display ports (DSI) : 1

J8:
  3V3 (1) (2) 5V
  GPIO2 (3) (4) 5V
  GPIO3 (5) (6) GND
  GPIO4 (7) (8) GPIO14
  GND (9) (10) GPIO15
  GPIO17 (11) (12) GPIO18
  GPIO27 (13) (14) GND
  GPIO22 (15) (16) GPIO23
  3V3 (17) (18) GPIO24
  GPIO10 (19) (20) GND
  GPIO9 (21) (22) GPIO25
  GPIO11 (23) (24) GPIO8
  GND (25) (26) GPIO7
  GPIO0 (27) (28) GPIO1
  GPIO5 (29) (30) GND
  GPIO6 (31) (32) GPIO12
  GPIO13 (33) (34) GND
  GPIO19 (35) (36) GPIO16
  GPIO26 (37) (38) GPIO20
  GND (39) (40) GPIO21

For further information, please refer to https://pinout.xyz/
pi@raspberrypi:~$

```

\$ sudo apt update

```
pi@raspberrypi:~ $ sudo apt update
Get:1 http://archive.raspberrypi.org/debian stretch InRelease [25.3 kB]
Get:2 http://raspbian.raspberrypi.org/raspbian stretch InRelease [15.0 kB]
Get:3 http://archive.raspberrypi.org/debian stretch/main armhf Packages
[175 kB]
Get:4 http://raspbian.raspberrypi.org/raspbian stretch/main armhf
Packages [11.7 MB]
Fetched 11.9 MB in 17s (675 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
9 packages can be upgraded. Run 'apt list --upgradable' to see them.
pi@raspberrypi:~ $
```



\$ sudo apt upgrade

```
pi@raspberrypi:~ $ sudo apt upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages will be upgraded:
  idle-python3.5 libpython3.5 libpython3.5-dev libpython3.5-minimal
  libpython3.5-stdlib python3.5 python3.5-dev python3.5-minimal python3.5-venv
9 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Need to get 42.9 MB of archives.
After this operation, 8192 B disk space will be freed.
Do you want to continue? [Y/n] y
Get:1 http://ftp.kaist.ac.kr/raspbian/raspbian stretch/main armhf python3.5-dev armhf 3.5.3-1+deb9u1 [413 kB]
Get:2 http://ftp.kaist.ac.kr/raspbian/raspbian stretch/main armhf libpython3.5-dev armhf 3.5.3-1+deb9u1 [36.9 MB]
Get:3 http://ftp.kaist.ac.kr/raspbian/raspbian stretch/main armhf libpython3.5 armhf 3.5.3-1+deb9u1 [1169 kB]
Get:4 http://ftp.kaist.ac.kr/raspbian/raspbian stretch/main armhf python3.5-venv armhf 3.5.3-1+deb9u1 [5932 B]
Get:5 http://ftp.kaist.ac.kr/raspbian/raspbian stretch/main armhf python3.5 armhf 3.5.3-1+deb9u1 [229 kB]
Get:6 http://ftp.kaist.ac.kr/raspbian/raspbian stretch/main armhf python3.5-minimal armhf 3.5.3-1+deb9u1 [1443 kB]
```

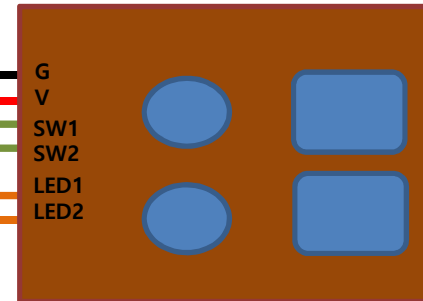
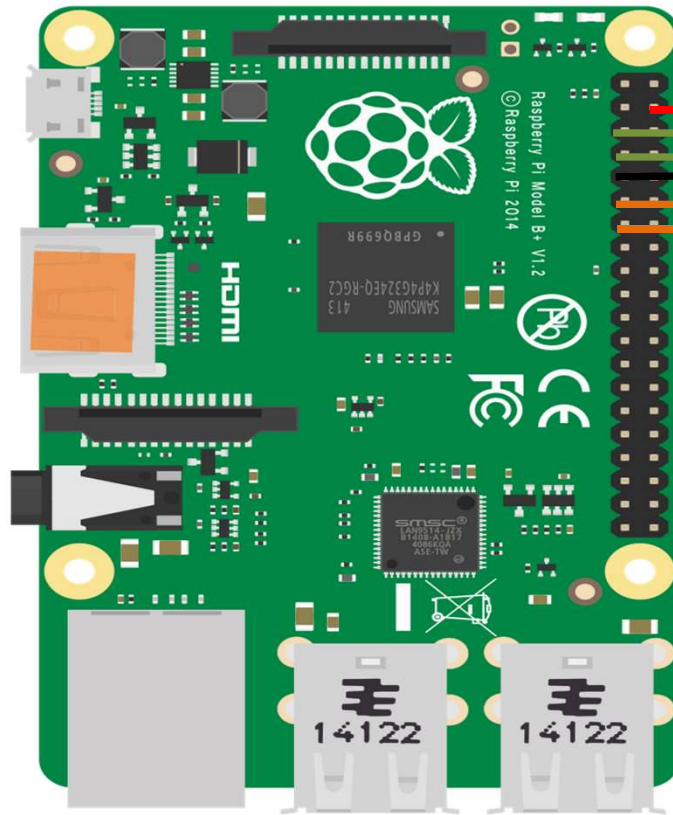


install python3-gpiozero

```
pi@raspberrypi:~ $ sudo apt install python3-gpiozero
Reading package lists... Done
Building dependency tree
Reading state information... Done
python3-gpiozero is already the newest version (1.4.1).
0 upgraded, 0 newly installed, 0 to remove and 9 not upgraded.
pi@raspberrypi:~ $
```



Wiring



SW1 -> GPIO3
SW2 -> GPIO4
LED1-> GPIO17
LED2-> GPIO27

All Models			
3V3 Power	1	2	5V Power
GPIO2 SDA I2C	3	4	5V Power
GPIO3 SCL I2C	5	6	Ground
GPIO4	7	8	GPIO14 UART0 TXD
Ground	9	10	GPIO15 UART0 RXD
GPIO17	11	12	GPIO18
GPIO27	13	14	Ground
GPIO22	15	16	GPIO23
3V3 Power	17	18	GPIO24
GPIO10 SPI MOSI	19	20	Ground
GPIO9 SPI MISO	21	22	GPIO25
GPIO11 SPI SCLK	23	24	GPIO8 SPI CE0
Ground	25	26	GPIO7 SPI CE1
ID SD I2C ID	27	28	ID SC I2C ID
GPIO5	29	30	Ground
GPIO6	31	32	GPIO12
GPIO13	33	34	Ground
GPIO19	35	36	GPIO16
GPIO26	37	38	GPIO20
Ground	39	40	GPIO21
40-pin models only			

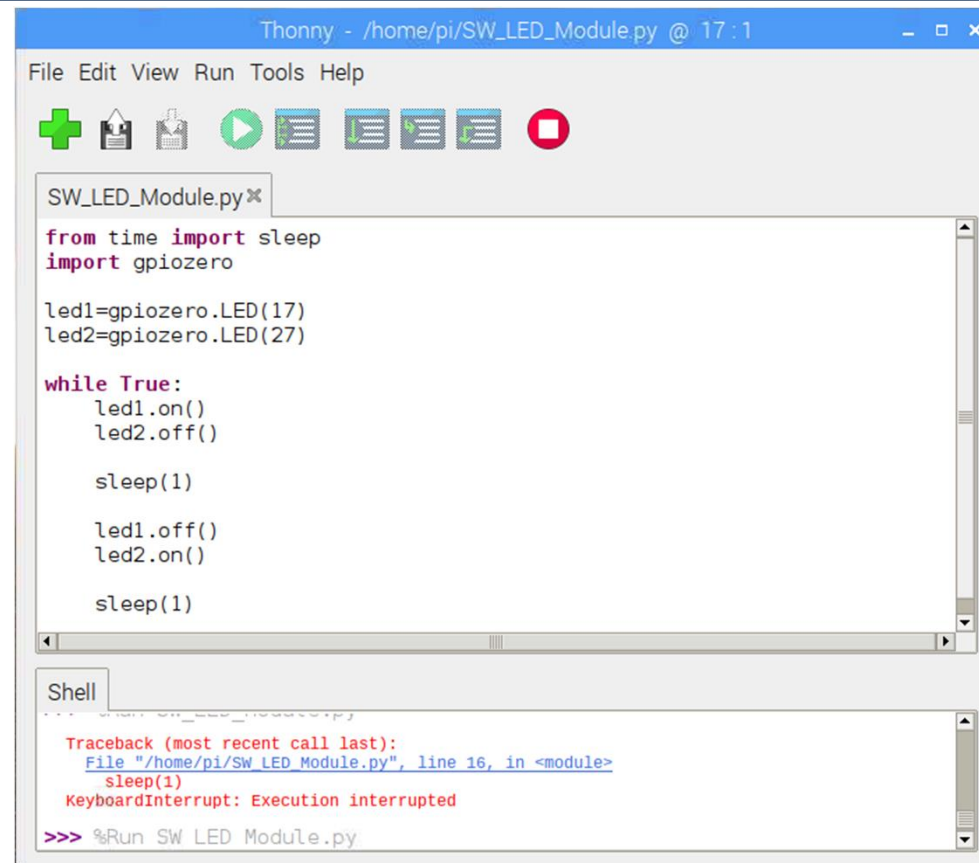


Ex1 : LED Twinkle

- 2개의 LED를 번갈아 켜는 Twinkle을 구현하자



SW_LED_Module.py



```
Thonny - /home/pi/SW_LED_Module.py @ 17:1
File Edit View Run Tools Help

SW_LED_Module.py x
from time import sleep
import gpiozero

led1=gpiozero.LED(17)
led2=gpiozero.LED(27)

while True:
    led1.on()
    led2.off()

    sleep(1)

    led1.off()
    led2.on()

    sleep(1)

Shell

Traceback (most recent call last):
  File "/home/pi/SW_LED_Module.py", line 16, in <module>
    sleep(1)
KeyboardInterrupt: Execution interrupted

>>> %Run SW_LED_Module.py
```



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Ex2 : Switch를 입력 받아 LED켜기

- 2개의 스위치를 입력받아 해당 LED를 켜보자



SW_LED_Module2.py

SW_LED_Module2.py *✕

```
from time import sleep
import gpiozero

led1=gpiozero.LED(17)
led2=gpiozero.LED(27)
sw1=gpiozero.Button(3)
sw2=gpiozero.Button(4)

while True:
    if sw1.is_pressed:
        led1.off()
    else:
        led1.on()
        print("Sw1 Pressed")

    if sw2.is_pressed:
        led2.off()
    else:
        led2.on()
        print("Sw2 Pressed")
```



Ex3 : def 함수를 만들어 보자

- Def 함수를 구현하여 프로그램을 최적화 하자



SW_LED_Module3.py

```
from time import sleep
Import gpiozero

led1=gpiozero.LED(17)
led2=gpiozero.LED(27)
sw1=gpiozero.Button(3)
sw2=gpiozero.Button(4)

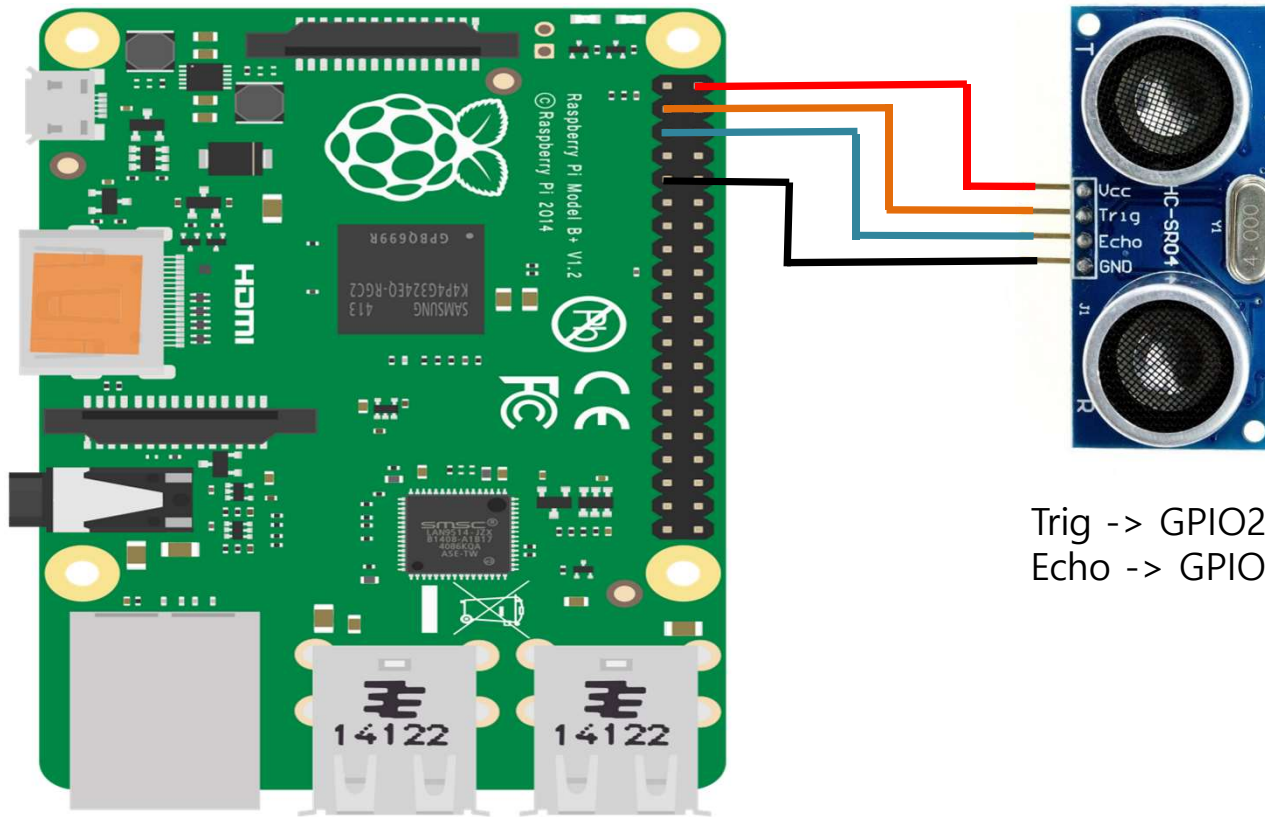
def Sw1_Pressed():
    led1.on()
    print("Sw1 Pressed")
def Sw2_Pressed():
    led2.on()
    print("Sw2 Pressed")
```

```
while True:
    if sw1.is_pressed:
        led1.off()
    else:
        Sw1_Pressed()

    if sw2.is_pressed:
        led2.off()
    else:
        Sw2_Pressed()
```



uSonic Sensor



Trig -> GPIO2
Echo -> GPIO3

All Models			
3V3 Power	1	2	5V Power
GPIO2 SDA I2C	3	4	5V Power
GPIO3 SCL I2C	5	6	Ground
GPIO4	7	8	GPIO14 UART0 TXD
Ground	9	10	GPIO15 UART0 RXD
GPIO17	11	12	GPIO18
GPIO27	13	14	Ground
GPIO22	15	16	GPIO23
3V3 Power	17	18	GPIO24
GPIO10 SPI MOSI	19	20	Ground
GPIO9 SPI MISO	21	22	GPIO25
GPIO11 SPI SCLK	23	24	GPIO8 SPI CE0
Ground	25	26	GPIO7 SPI CE1
ID SD I2C ID	27	28	ID SC I2C ID
GPIO5	29	30	Ground
GPIO6	31	32	GPIO12
GPIO13	33	34	Ground
GPIO19	35	36	GPIO16
GPIO26	37	38	GPIO20
Ground	39	40	GPIO21
40-pin models only			



Ex4 : uSonic Sensor

```
import RPi.GPIO as gpio
import time
```

```
gpio.setmode(gpio.BCM)
trig = 2
echo = 3
```

```
print("start")
gpio.setup(trig, gpio.OUT)
gpio.setup(echo, gpio.IN)
```

```
try :
    while True :
        gpio.output(trig, False)
        time.sleep(0.5)
        gpio.output(trig, True)
        time.sleep(0.00001)
        gpio.output(trig, False)
        while gpio.input(echo) == 0 : pulse_start = time.time()
        while gpio.input(echo) == 1 : pulse_end = time.time()
        pulse_duration = pulse_end - pulse_start
        distance = pulse_duration * 17000
        distance = round(distance, 2)
        print("Distance : ", distance, "cm")
except :
    gpio.cleanup()
```

