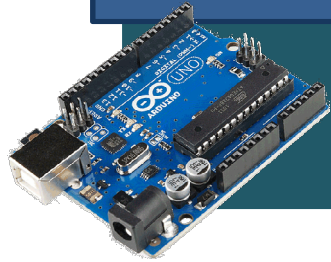


2022년 IoT기반 스마트 솔루션 개발자 양성과정



Firmware [펌웨어]

12-Sound Sensor

담당 교수 : 유 근 택

010-5486-5376

rgt3340@naver.com

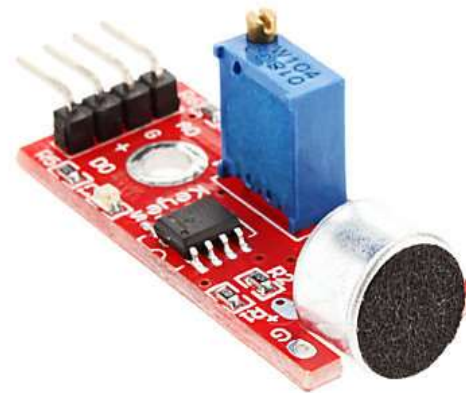
<https://cafe.naver.com/cbdsp>



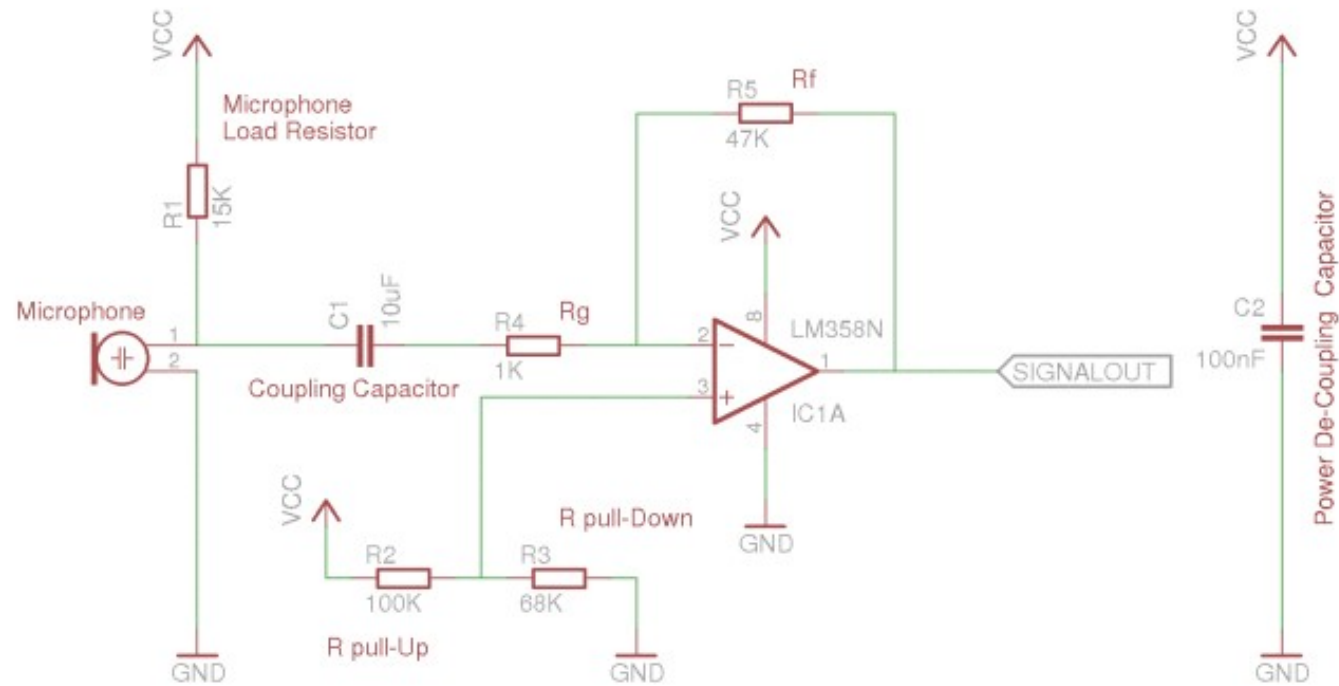
충북대학교 공동훈련센터

Sound 센서

- 마이크로 입력된 소리 신호를 증폭하여 아날로그 신호로 출력함
- 제조사 마다 다른 회로를 갖고 있으며, 적용 시 데이터 시트를 확인하여야 함



회로도

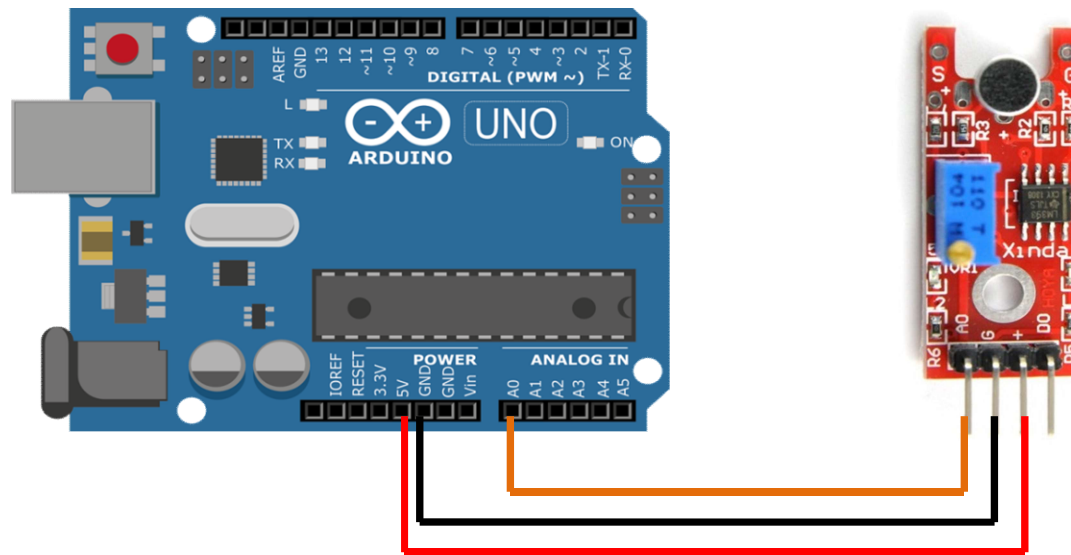


Aduino Syntex

- analogRead(pin)
 - pin : Analog Port No (0~5)
 - 입력된 아날로그 신호를 디지털화된 숫자로 변환
- analogWrite(pin,value)
 - pin : Digital Pin No (PWM ~)
 - UNO : 3, 5, 6, 9, 11
 - 지정된 핀으로 PWM신호로 출력함
- map(value, fromLow, fromHigh, toLow, toHigh)
 - value값 (범위 : fromLow에서 fromHigh)
 - 출력값 (범위 : toLow, toHigh) : value값으로 환산
 - $\text{Return} = (\text{value} - \text{fromLow}) \times (\text{toHigh} - \text{toLow}) / (\text{fromHigh} - \text{fromLow}) + \text{toLow}$



A12-1 : Wiring



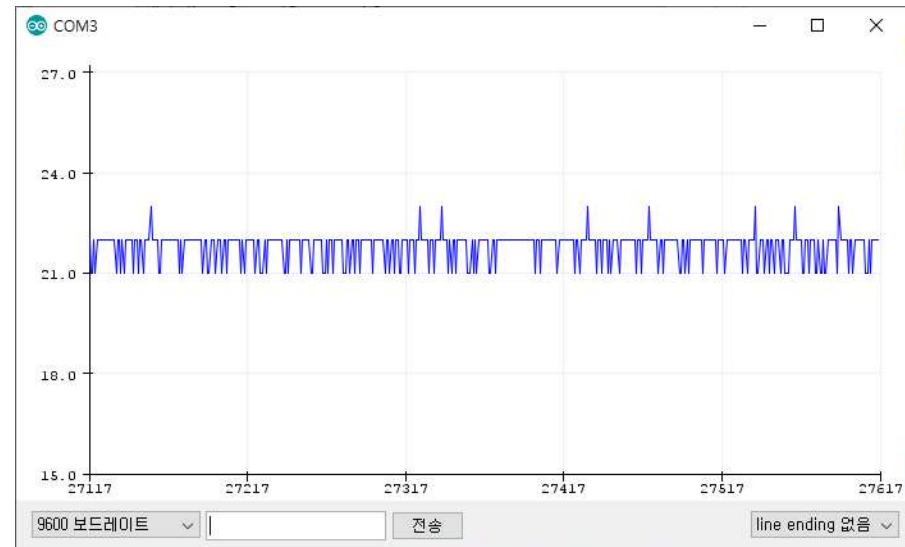
충북대학교 공동훈련센터

A12-1 : Coding

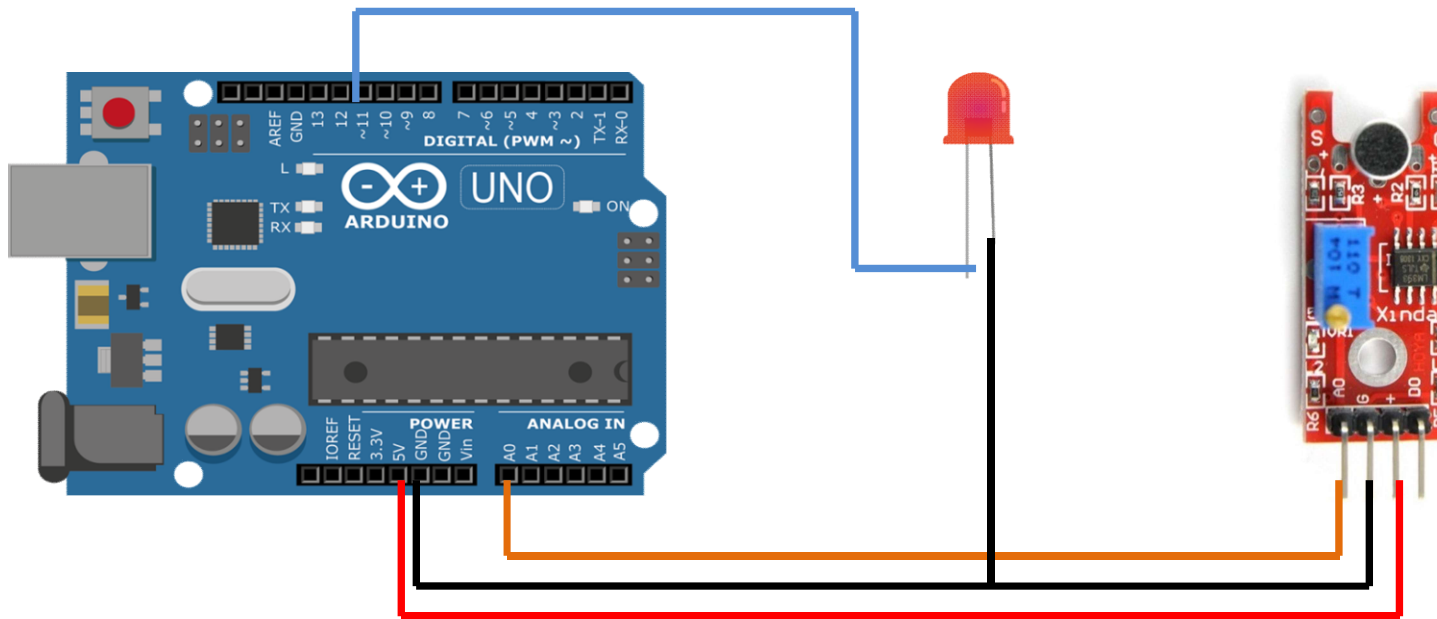
```
#define SoundSensor A0
int SoundLevel;

void setup( ) {
  Serial.begin(9600);
}

void loop( ) {
  SoundLevel=analogRead(SoundSensor);
  Serial.println(SoundLevel);
}
```



A12-2 : Wiring



A0로 입력된 소리신호를 변환하여 소리신호의 크기에 따라 LED(11)의 밝기를 조절합니다
소리신호의 크기는 사운드 센서의 포텐서 메터를 돌려 조절합니다



A12-2 :analog output

```
1.  int sensorPin = A0; // select the input pin for the
    potentiometer
2.  int ledPin = 13; // select the pin for the LED
3.  int sensorValue = 0;

4.  void setup ()
5.  {
6.      pinMode (ledPin, OUTPUT);
7.      Serial.begin (9600);
8.  }

9.  void loop ()
10. {
11.     sensorValue = analogRead (sensorPin);
12.     digitalWrite (ledPin, HIGH);
13.     delay (sensorValue);

14.     digitalWrite (ledPin, LOW);
15.     delay (sensorValue);

16.     Serial.println (sensorValue, DEC);
17. }
```



A12-2 : Coding

```
#define SoundSensor A0
#define PWM_LED 11
int SoundLevel;
int Intensity;

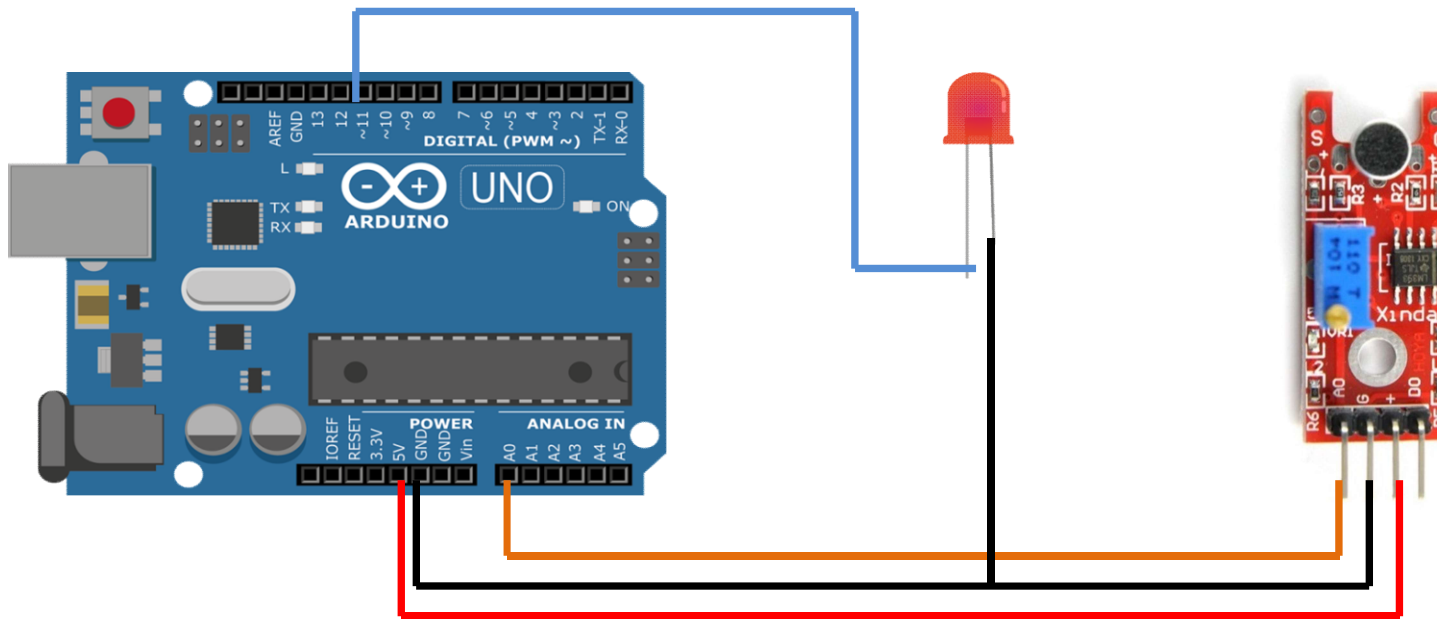
void setup() {
  pinMode(PWM_LED,OUTPUT);
  Serial.begin(9600);
}

void loop() {
  SoundLevel=analogRead(SoundSensor);
  Intensity=map(SoundLevel,50,800,0,255);

  analogWrite(PWM_LED,Intensity);
  Serial.println(SoundLevel);
}
```



A12-3 : Wiring



Circular Queue를 사용하여 데이터를 저장하고
산술평균을 이용하여 파형을 Smooth하게 표현해 보자



충북대학교 공동훈련센터

A12-3 : Coding

```
#define SoundSensor A0
#define PWM_LED 11
#define MaxQue 4
int QSound[MaxQue];
char QPoint=0;
int adValue;
int SoundLevel;
int Intensity;

void CircularQueue( int Value ) {
    QSound[ QPoint ] = Value;
    if ( ++QPoint > MaxQue - 1 ) QPoint = 0;
}

unsigned int mean( ) {
    unsigned int Temp = 0;
    for ( int K = 0 ; K < MaxQue ; K++ ) Temp += QSound[ K ];
    return Temp / MaxQue;
}
```

```
void setup( ) {
    pinMode(PWM_LED,OUTPUT);
    Serial.begin(9600);
}

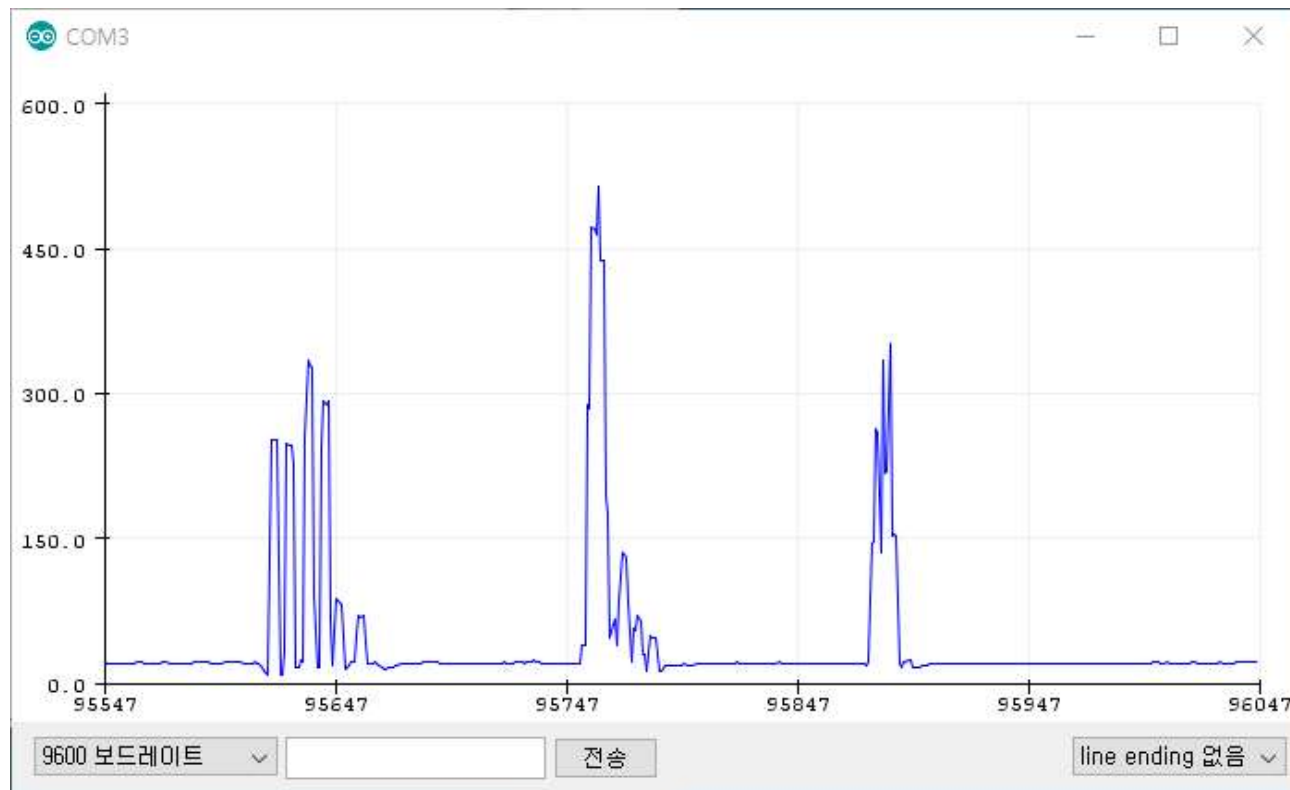
void loop( ) {
    adValue=analogRead(SoundSensor);
    CircularQueue(adValue);
    SoundLevel=mean();

    Intensity=map(SoundLevel, 20, 300, 0, 255);

    analogWrite(PWM_LED,Intensity);
    Serial.println(SoundLevel);
}
```

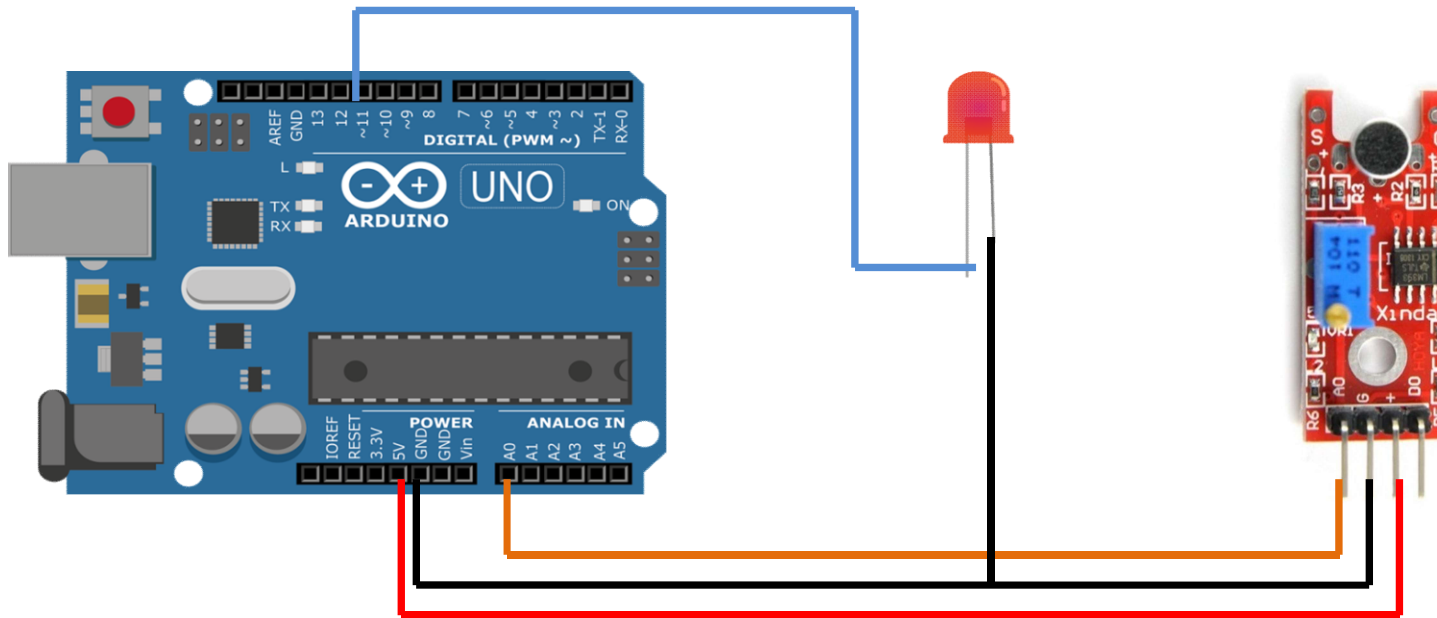


A12-3 : Serial Plotter



충북대학교 공동훈련센터

A12-3 : Wiring

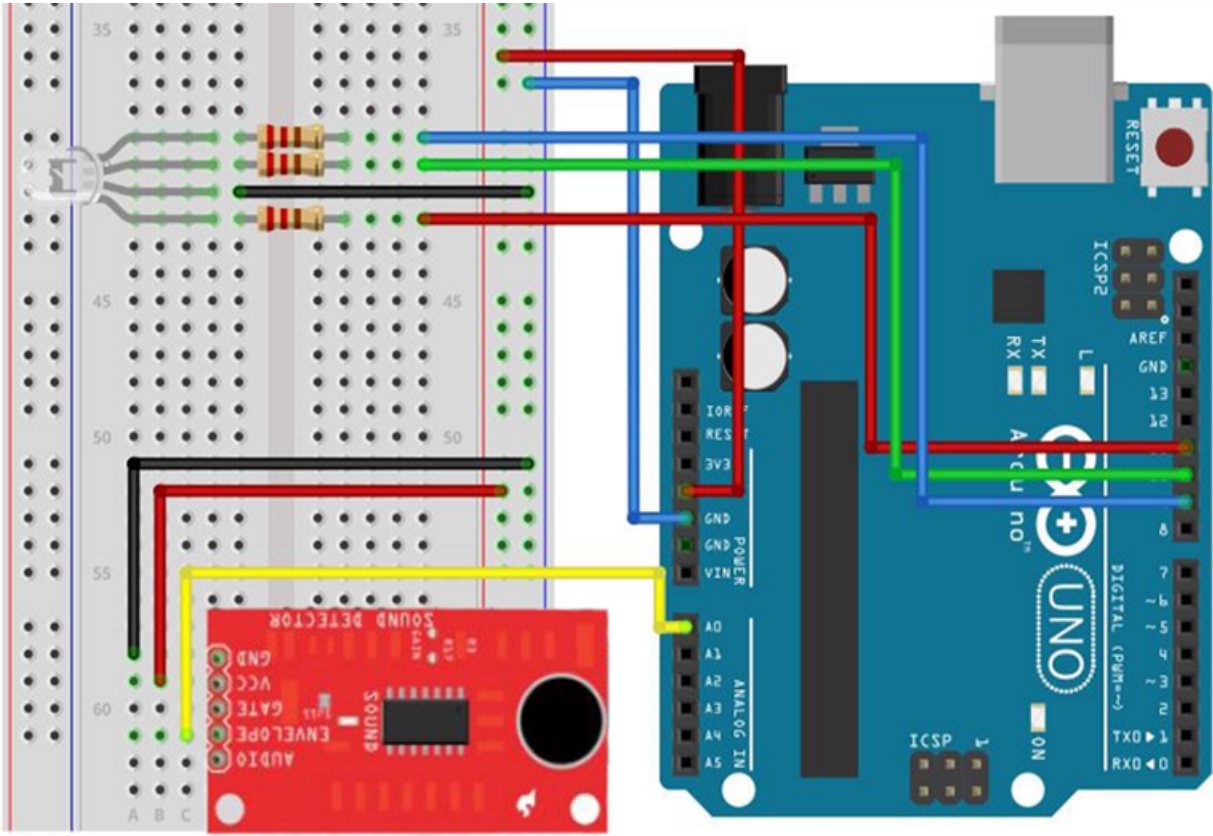


LED를 Hysteresis On/Off제어를 구현하자



충북대학교 공동훈련센터

A12-4 KY-037 and RGB LED



A12-4 coding

```
1. int red = 11;
2. int green = 10;
3. int blue = 9;
4. int volum;

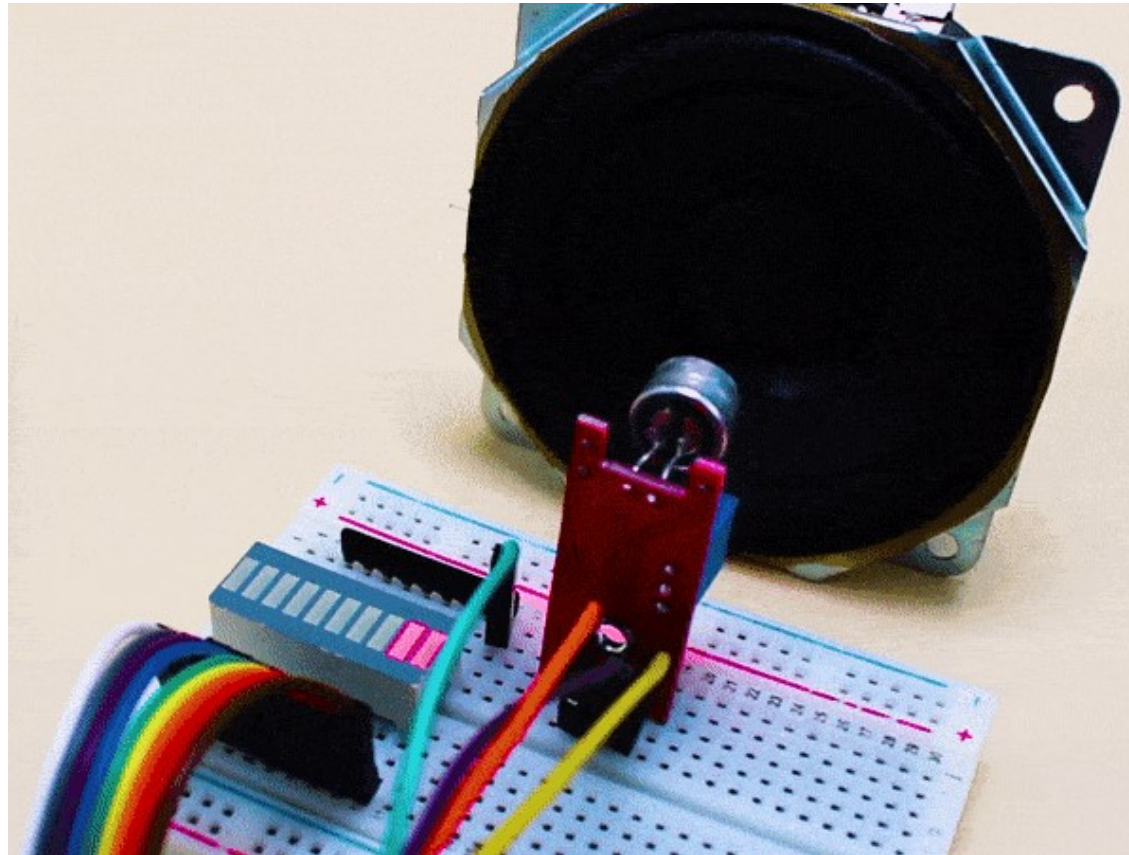
5. void ()
6. { Serial.begin(9600);
7.   pinMode(red, OUTPUT);
8.   pinMode(green, OUTPUT);
9.   pinMode(blue, OUTPUT);
10. }

11. void ()
12. { volum = analogRead(A0);
13.   Serial.println(volum);
14.   delay(100);
15.

16. if (volum <= 50) {
17.   digitalWrite(red, LOW);
18.   digitalWrite(green, LOW);
19.   digitalWrite(blue, HIGH);
20. } else if (volum <= 52)
21. { digitalWrite(red, LOW);
22.   digitalWrite(green, HIGH);
23.   digitalWrite(blue, LOW);
24. }
25. else if (volum <= 55)
26. { digitalWrite(red, HIGH);
27.   digitalWrite(green, LOW);
28.   digitalWrite(blue, LOW); }
29. }
```



A12-5 : KY-037 sound detection



A12-5 coding

```
1.  /* KY-037 Sound Detection Sensor + Arduino */
2.  int sensor_value = 0;
3.  int threshold = 540;
4.  int abs_value = 0;
5.  int ledCount = 10;
6.  int bargraph[] = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9};

7.  void setup()
8.  { Serial.begin(9600); // setup serial
9.    for (int i = 0; i <= ledCount; i++)
10.     { pinMode(bargraph[i], OUTPUT); }
11.    for (int i = 0; i <= 9; i++)
12.     { digitalWrite(i, LOW); }
13. }

14. void loop()
15. { sensor_value = analogRead(A0);
16.   abs_value = abs(sensor_value - threshold);
17.   int ledLevel = map(abs_value, 0, (1024 -
18.     threshold), 0, ledCount);
19.   {
20.     if (i < ledLevel) {
21.       digitalWrite(bargraph[i], HIGH);
22.       Serial.println(i);
23.     }else{
24.       digitalWrite(bargraph[i], LOW);
25.     }
26.   }
27. }
```

