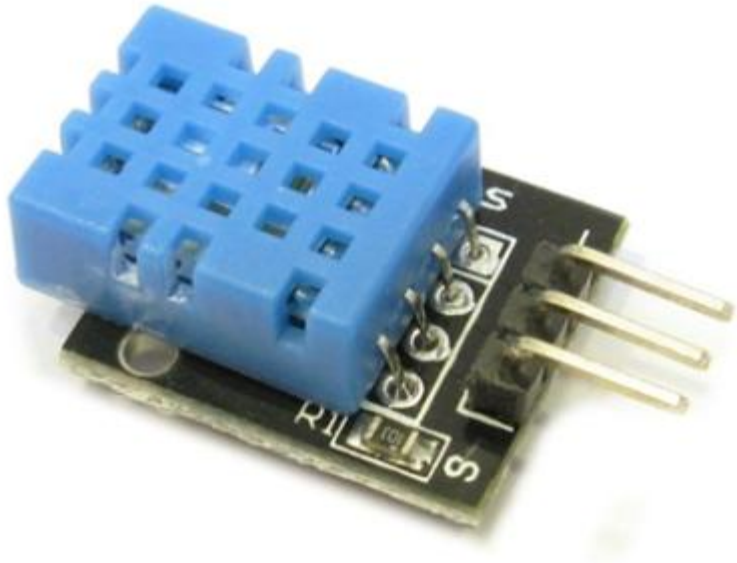
센서 라이브러리 활용
+ 퀴즈(10%성적반영)

목표

- 인터럽트를 이용한 화재 감지 실험
- 라이브러리를 이용한 센서 데이터 확인 및 활용

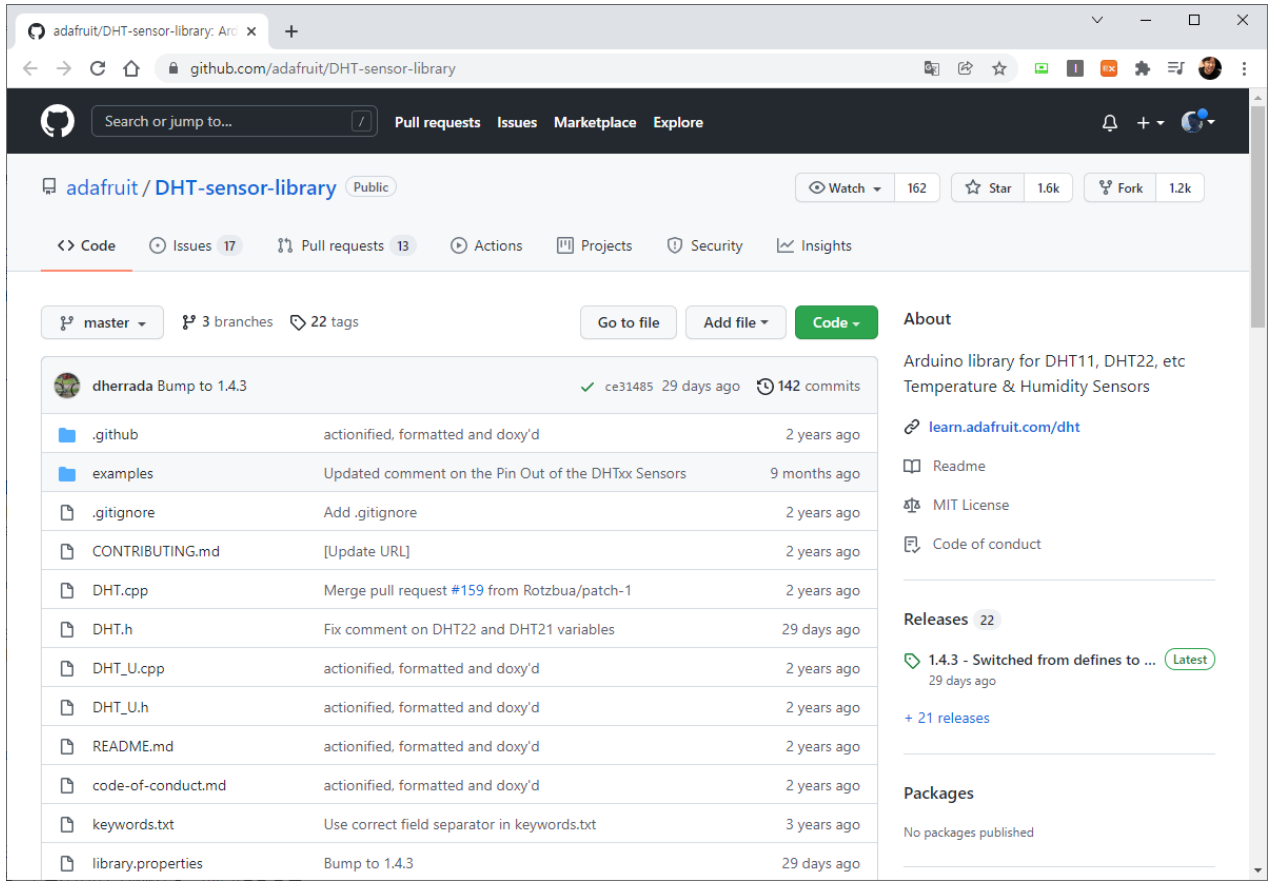
DHT11

- 동작 전압 (Power) 3~5 V
- 온도 측정 범위 (Temperature range) 0 ~ 50 ℃ (±2 ℃)
- 습도 측정 범위 (Humidity range) 20 ~ 80 % (±5 %)
- 최대소비전력 (Max. current) 2.5 mA
- 데이터 주기 (sampling rate) 1 Hz

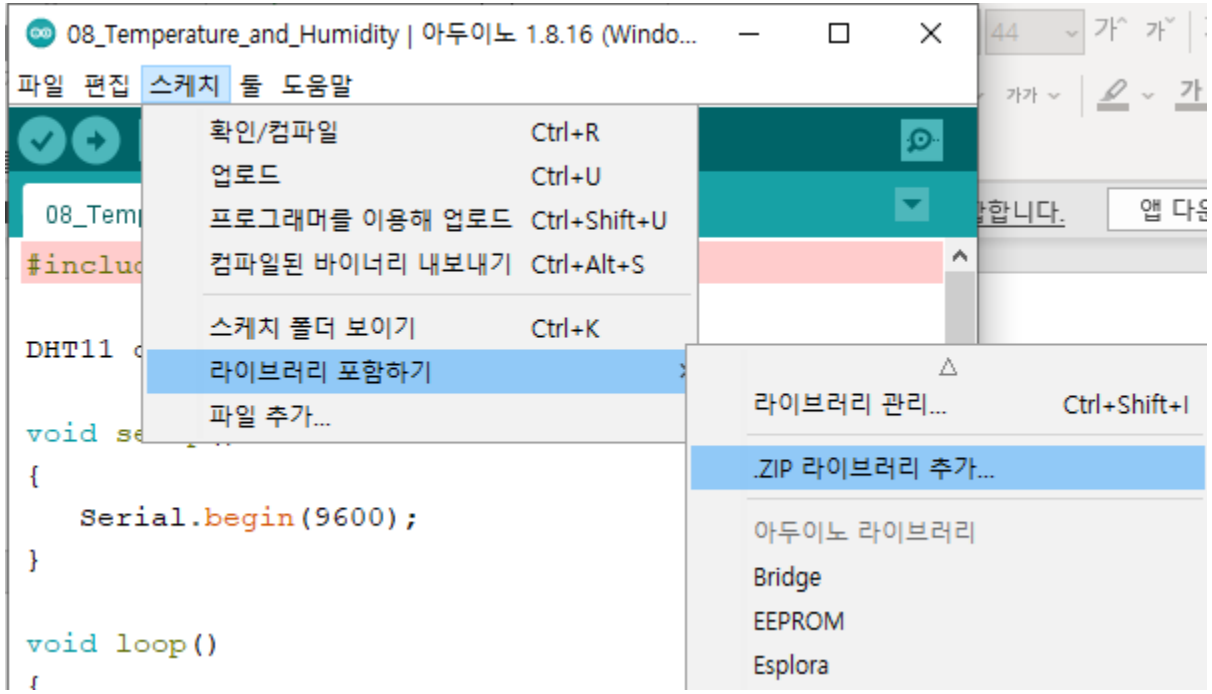


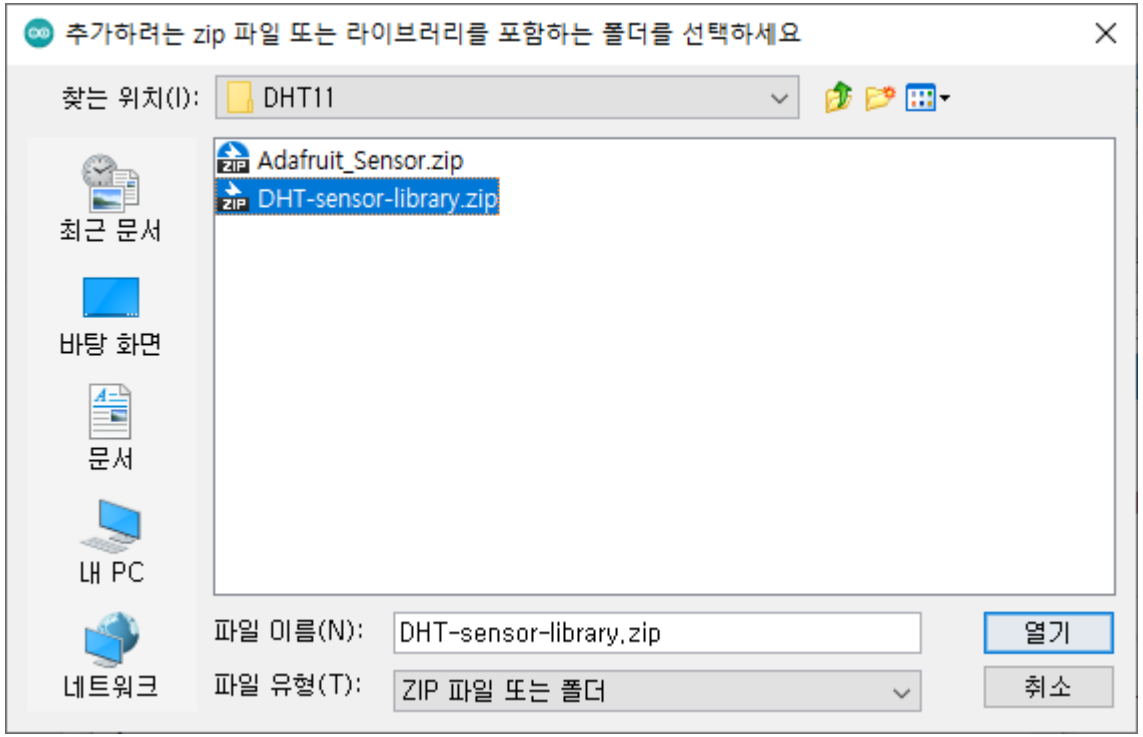
DHT11 라이브러리 사용

- https://github.com/adafruit/DHT-sensor-library



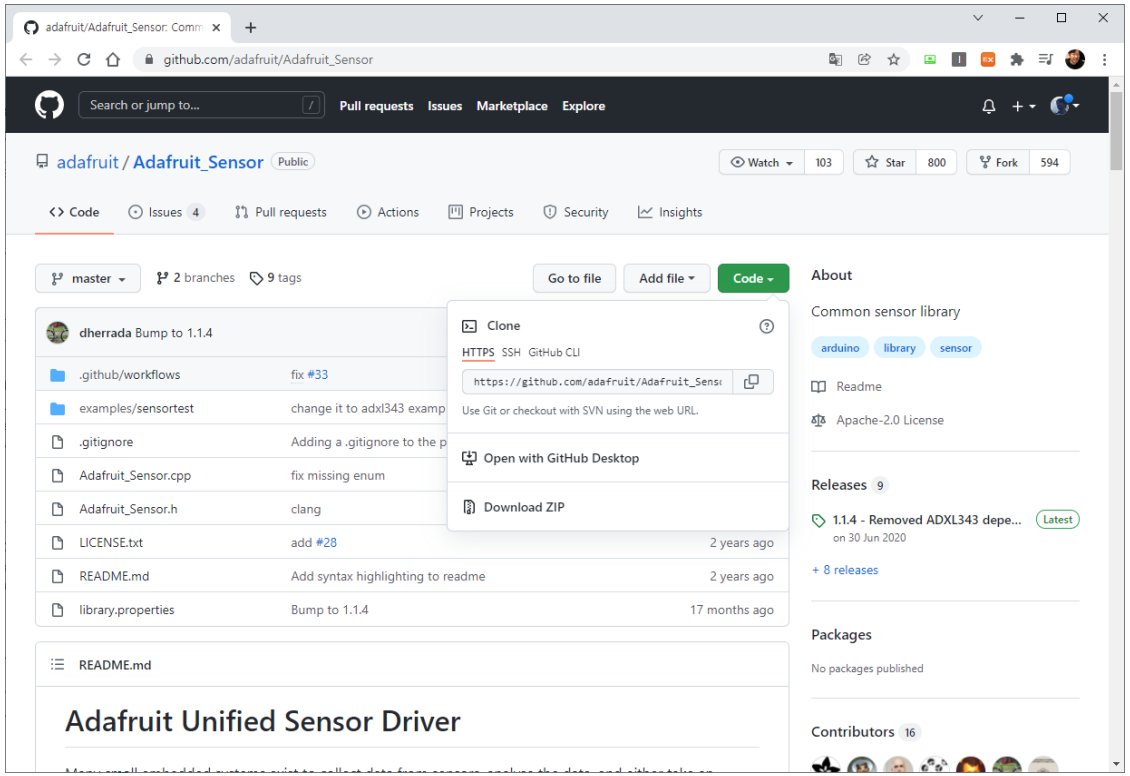
DHT11 라이브러리 사용



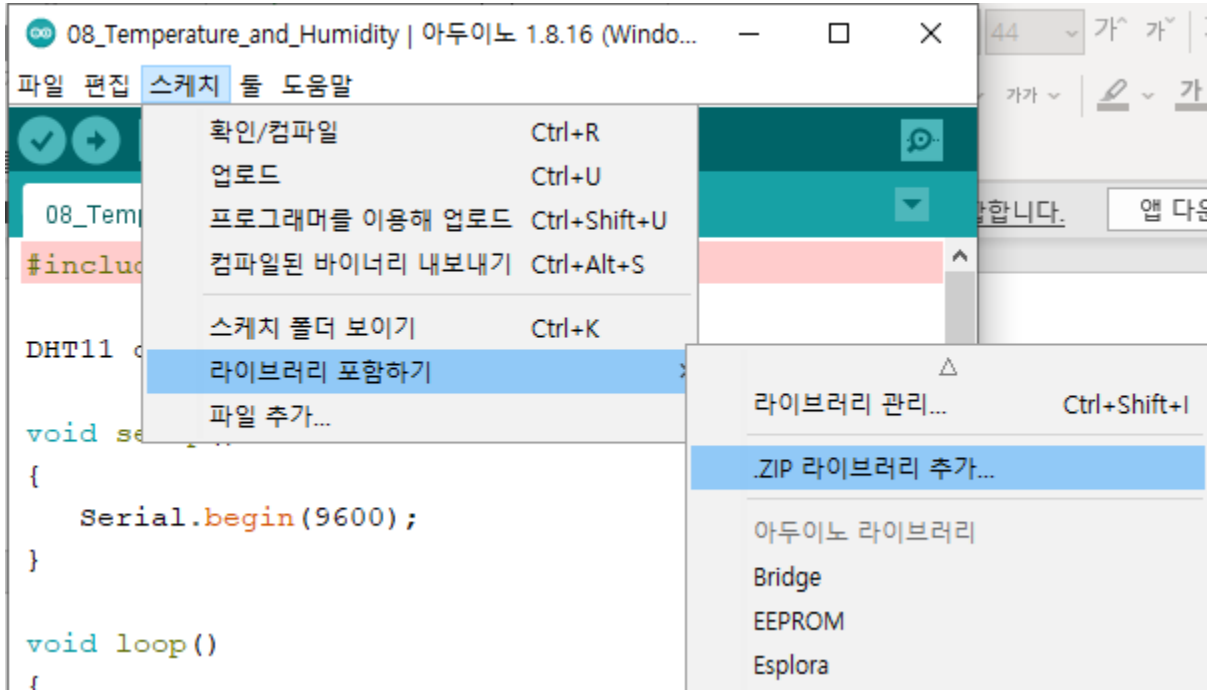


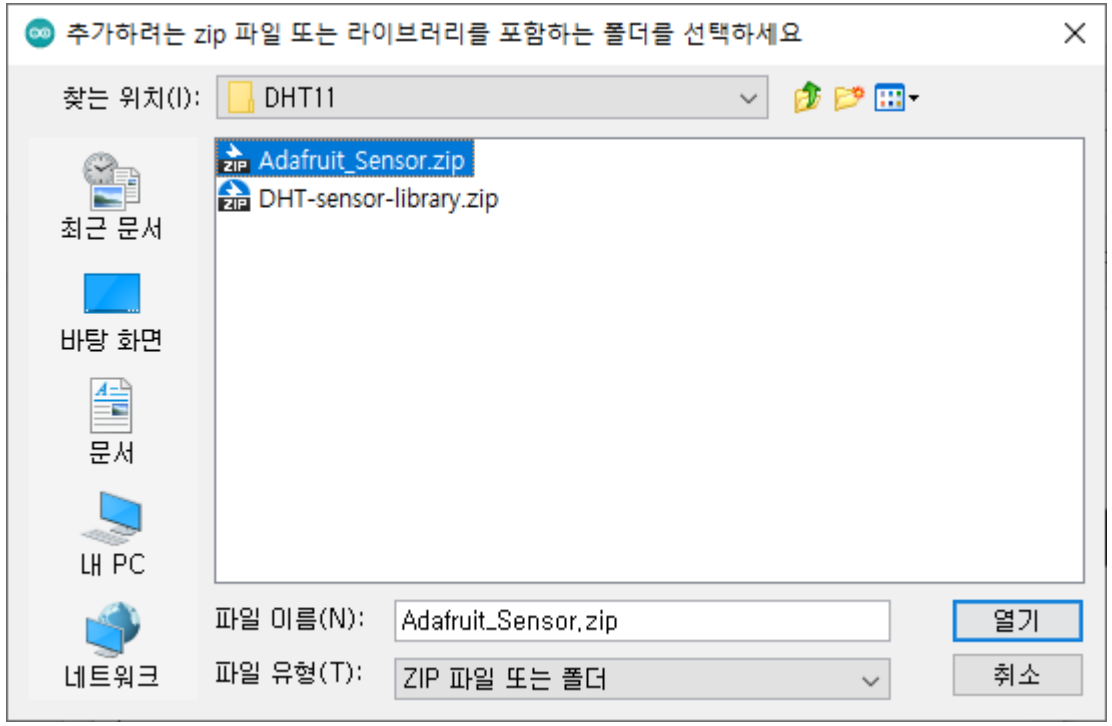
DHT11 라이브러리 사용

- adafruit_sensor.h no such file 에러 발생
- https://github.com/adafruit/Adafruit_Sensor 라이브러리 추가



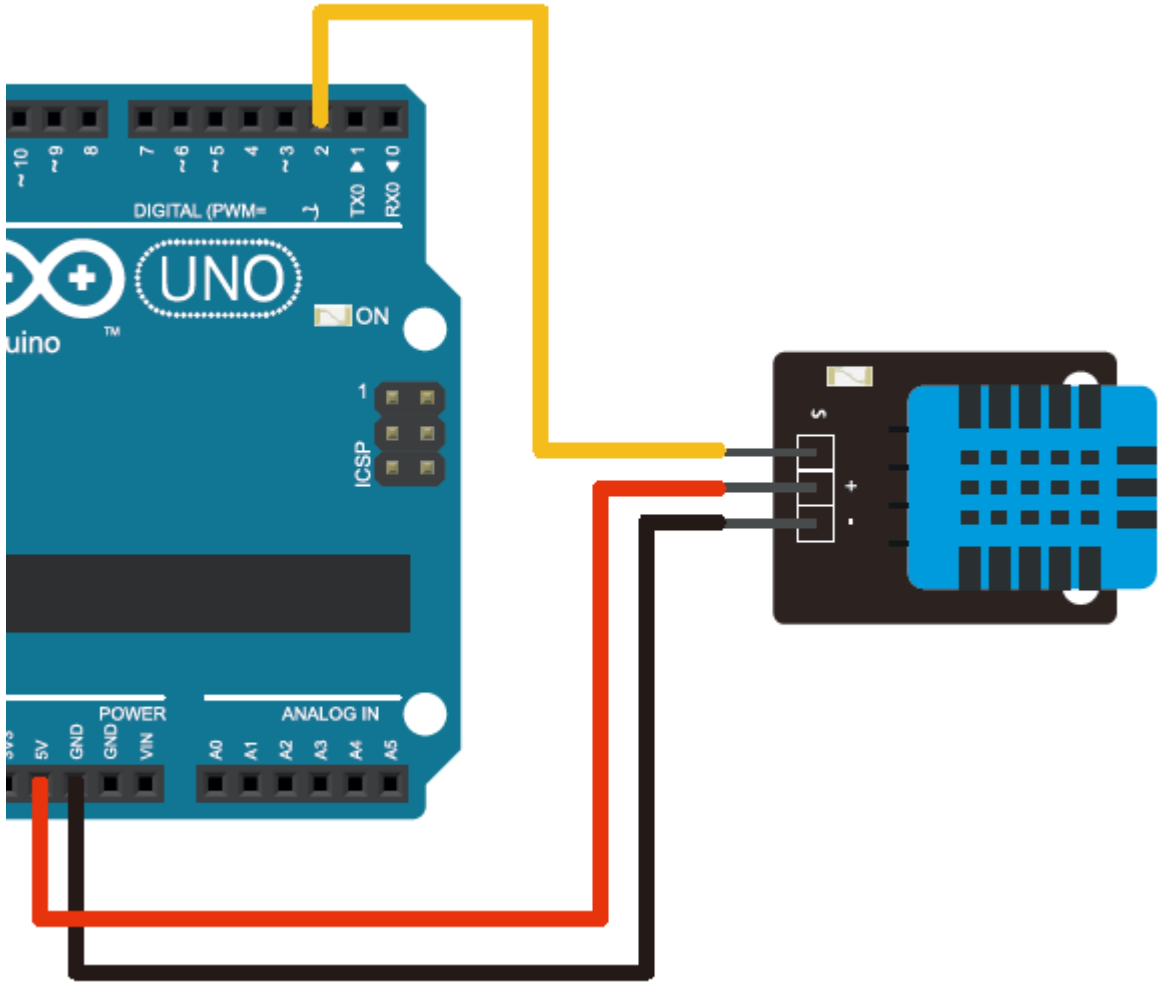
DHT11 라이브러리 사용



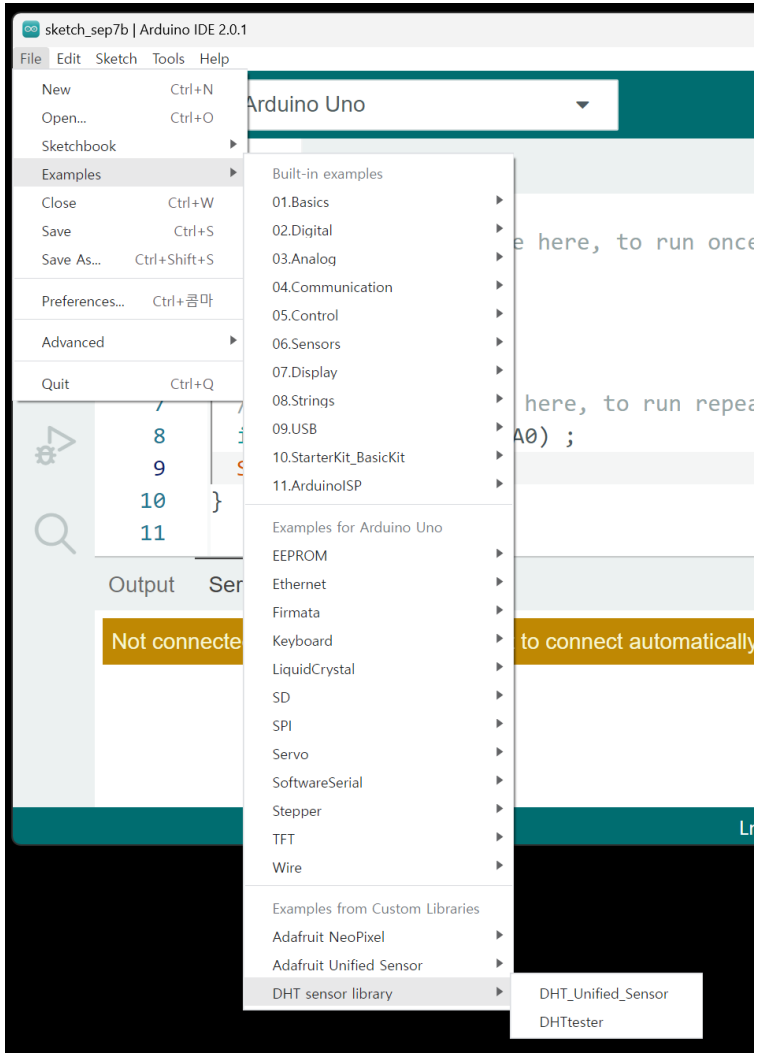


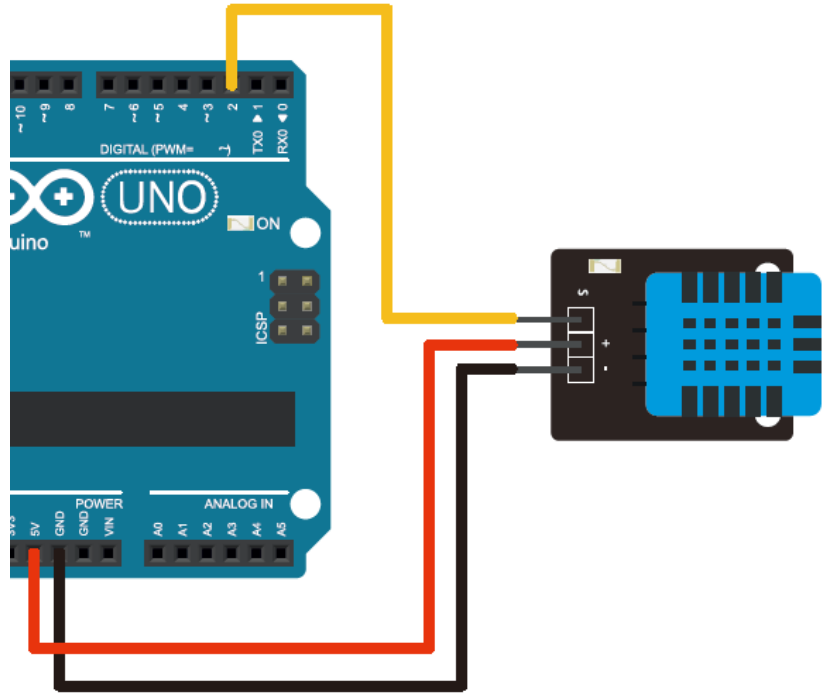
DHT11 아두이노 테스트

- S(signal) : 아두이노 2번핀
- + : VCC(5V)
- - : GND(0V)

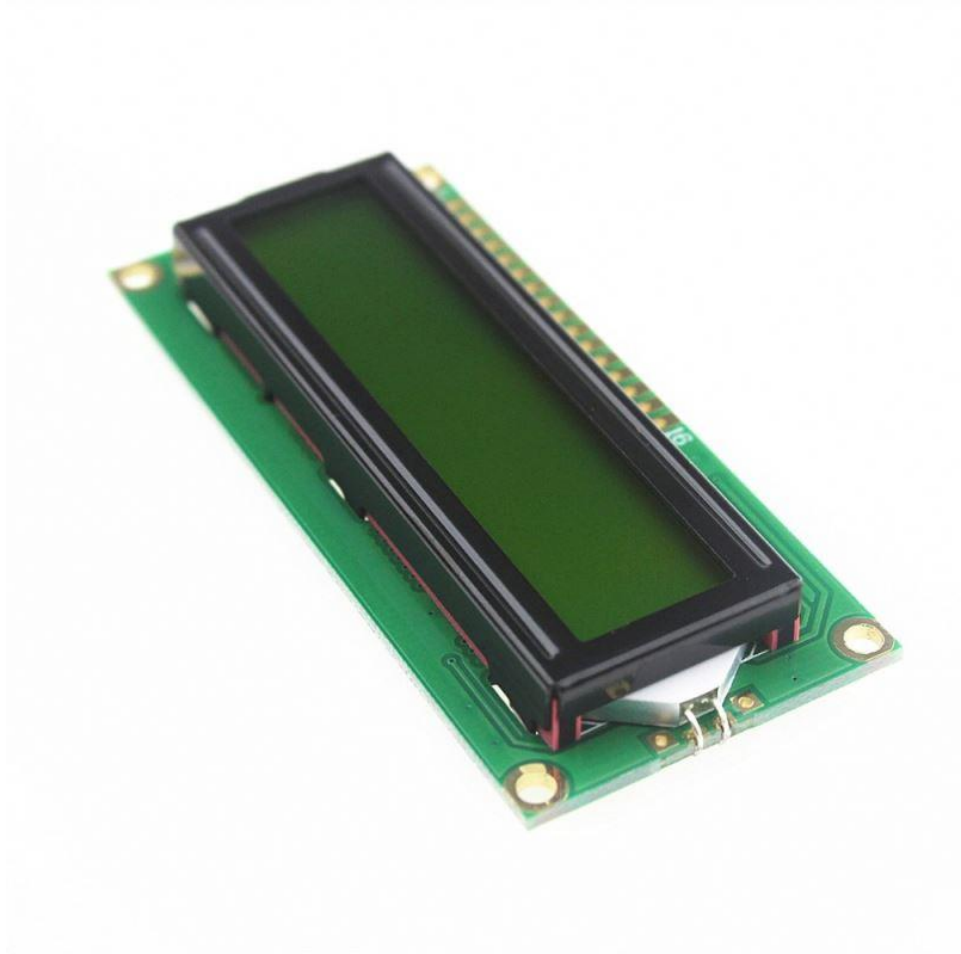


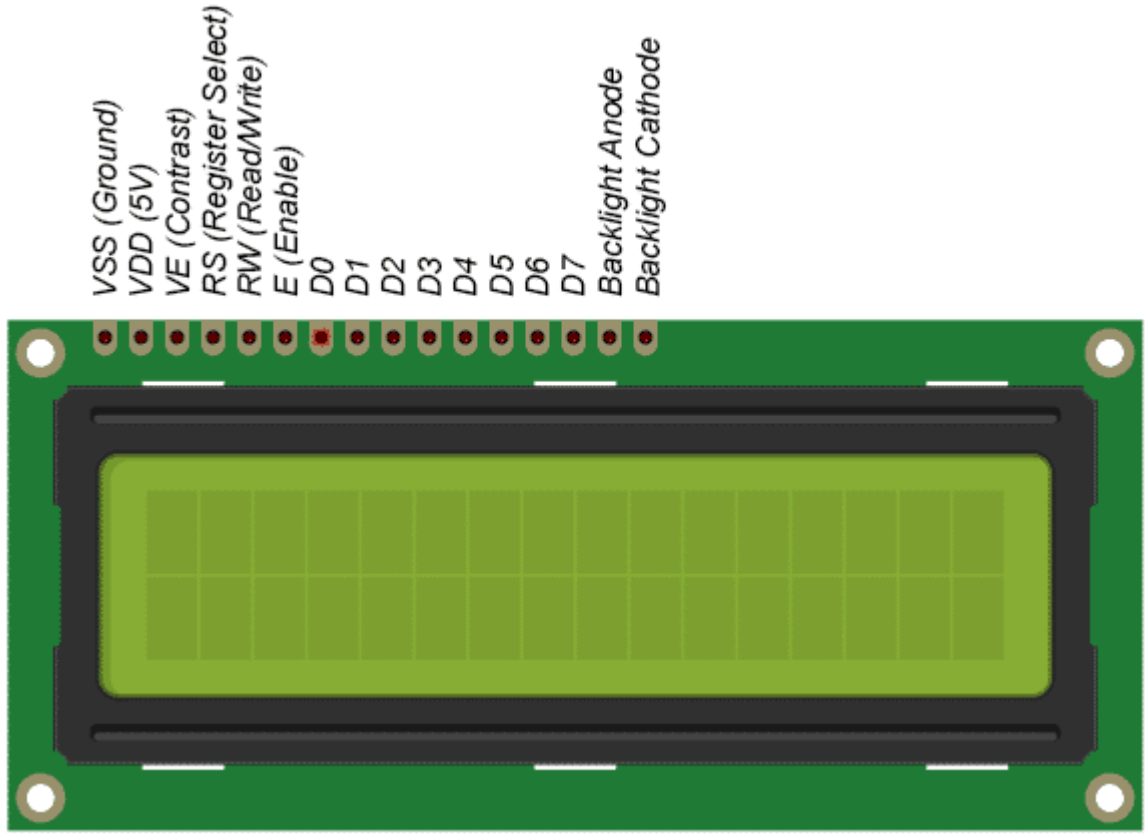
DHT11 아두이노 테스트(Example 코드 활용)





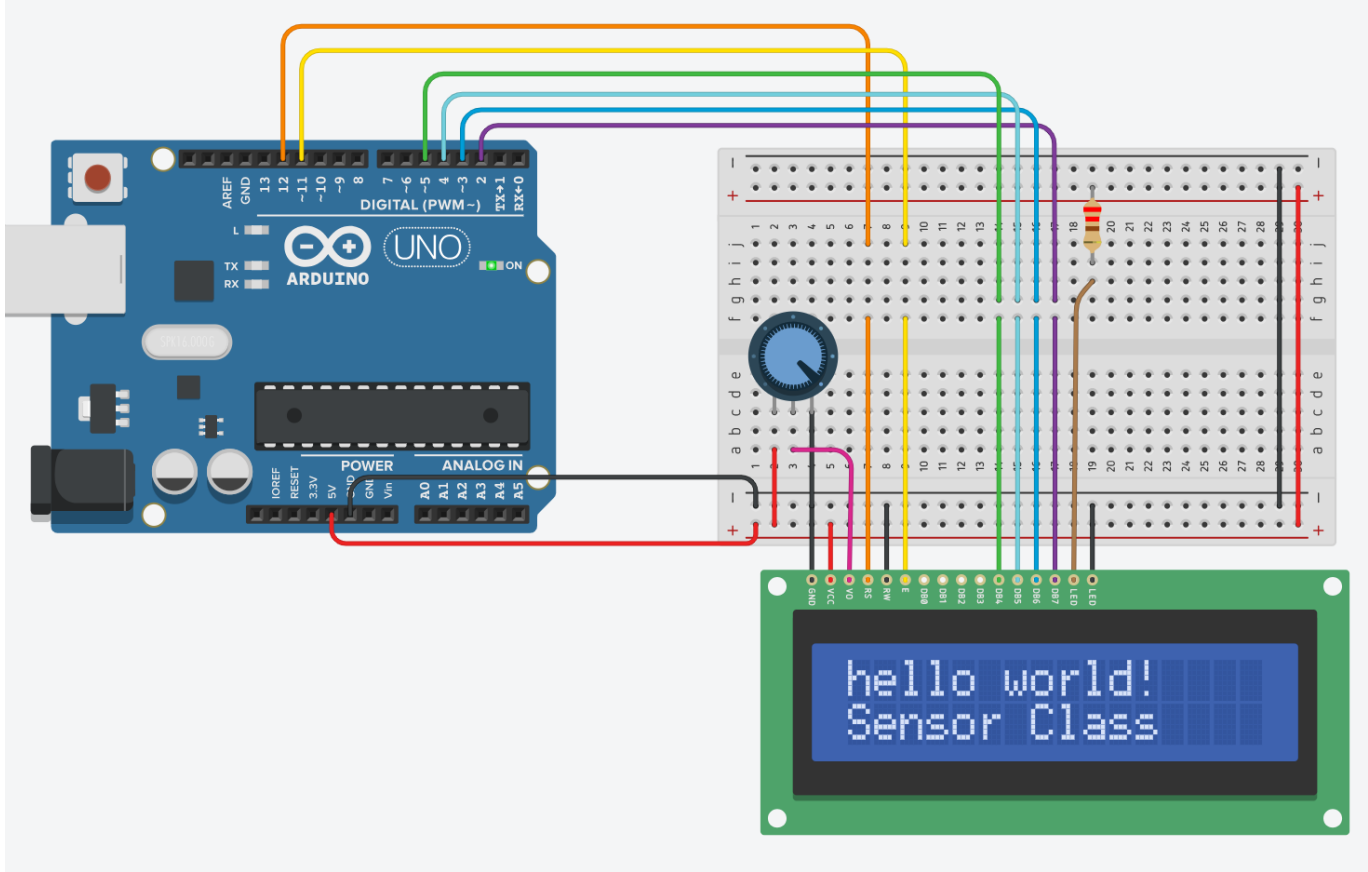
16x2 Character LCD





16x2 Character LCD 실험

- **아두이노 Example을 이용**



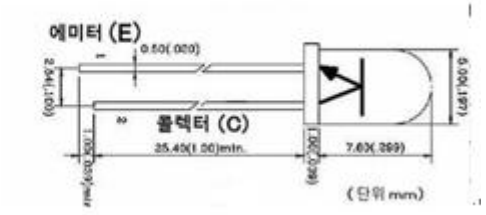

```
#include <LiquidCrystal.h>

LiquidCrystal lcd_1(12, 11, 5, 4, 3, 2);

void setup()
{
  lcd_1.begin(16, 2);
}

void loop()
{
  lcd_1.setCursor(0, 0);
  lcd_1.print("hello world!");

  lcd_1.setCursor(0, 1);
  lcd_1.print("Sensor Class");
  delay(1000);
}
```

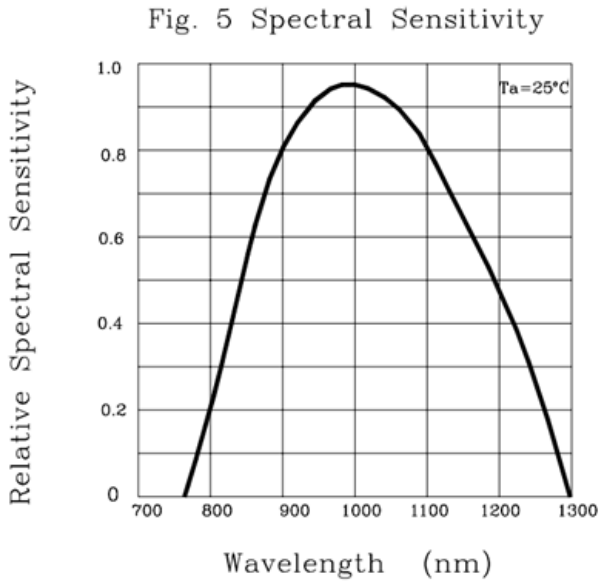
QUIZ

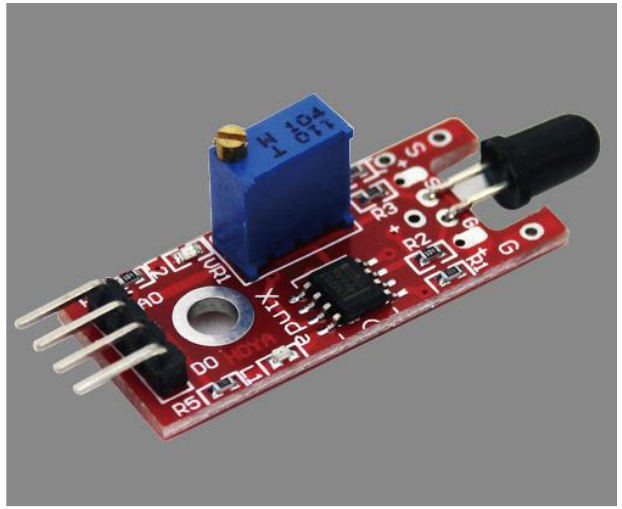
- **LCD에 현재 온도와 습도를 표시하시오**

불꽃감지센서 (Flame sensor)

- 불꽃 또는 화염은 사람의 눈으로 확인 할 수 없는 자외선과 적외선의 파장이 발생
- 불꽃감지센서는 적외선 감지센서로서 760nm ~ 1100nm파장을 감지한다.

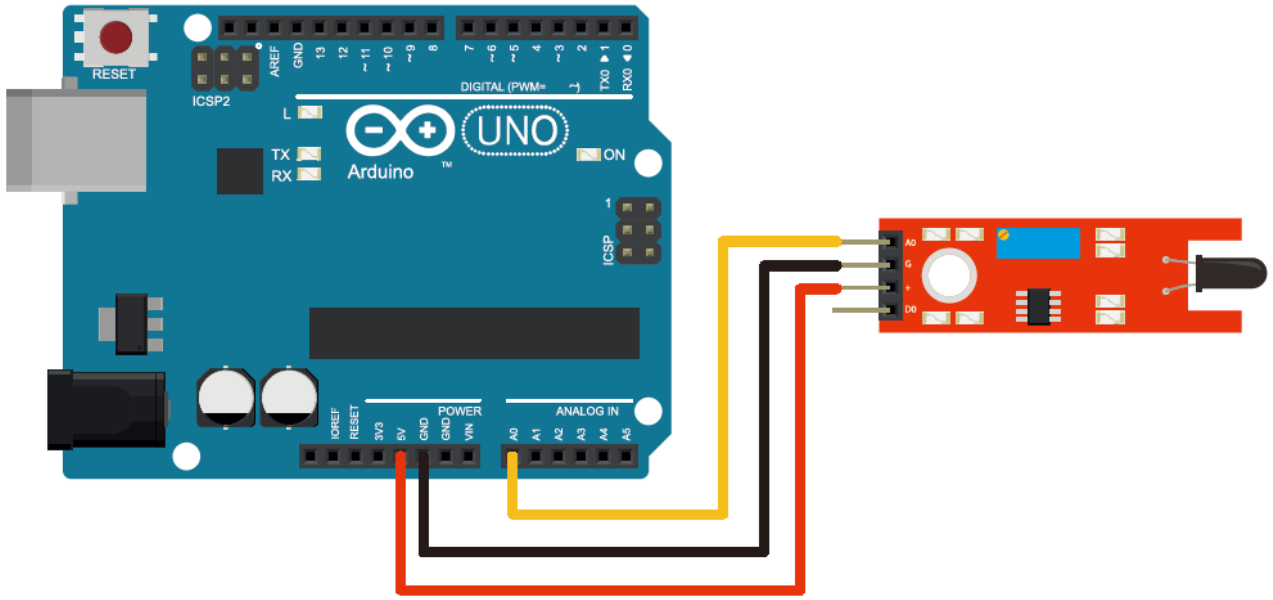






불꽃감지센서 (Flame sensor)

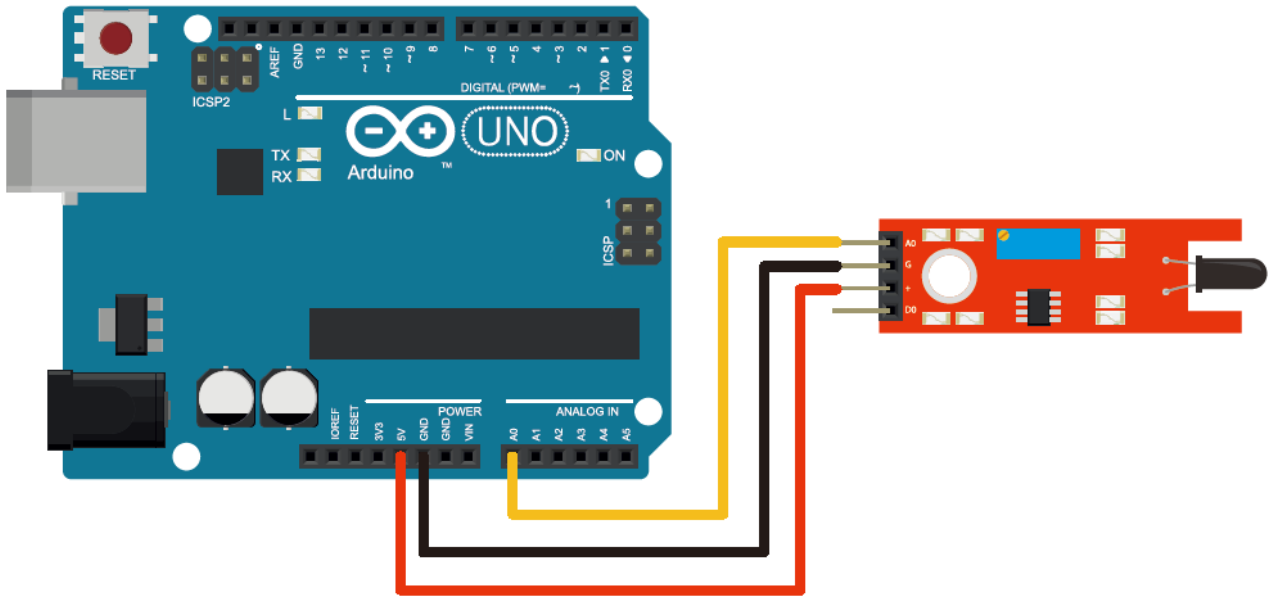
- 불꽃 감지 아두이노 실험 구성
  - 센서모듈 A0 <> 아두이노 A0
  - 센서모듈 G <> 아두이노 GND
  - 센서모듈 + <> 아두이노 5V



불꽃감지센서 (Flame sensor)

- 불꽃 감지 아두이노 실험 코드 작성

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

void loop()
{
    int analog_value = analogRead(A0);

    Serial.println(analog_value);

    delay(100);
}
```

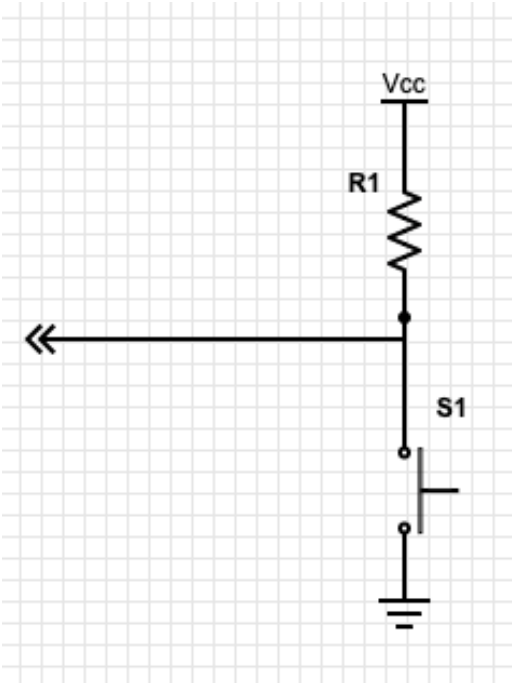


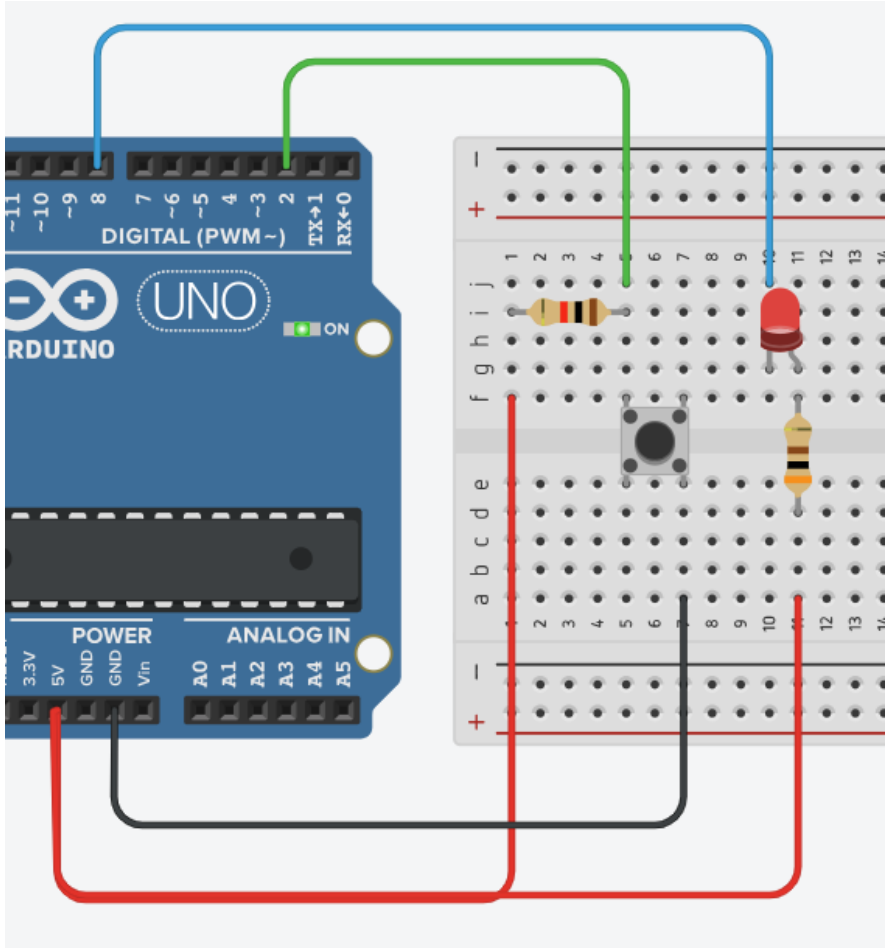
불꽃감지센서를 이용한 화재감지 응용

- 인터럽트를 이용하여 불꽃이 감지되면 소리와 빛을 내는 시스템을 제작하고 사진과 코드를 아래의 이메일 주소로 전송
- **juhong.park@farmily.ai**

외부 인터럽트(External Interrupt)

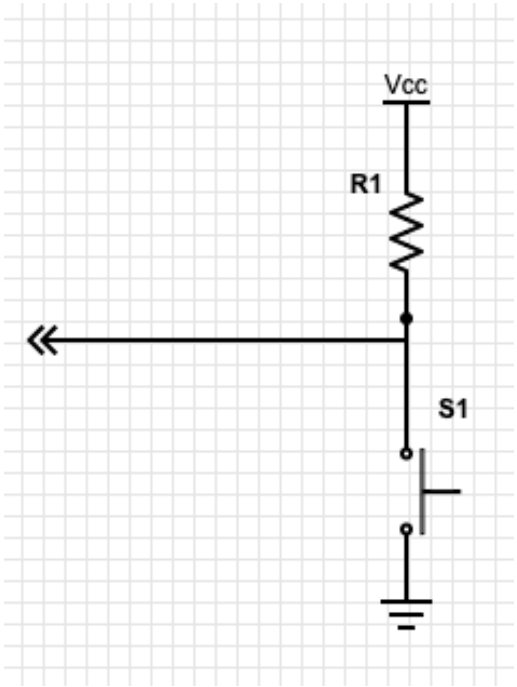
- **폴링** vs 인터럽트

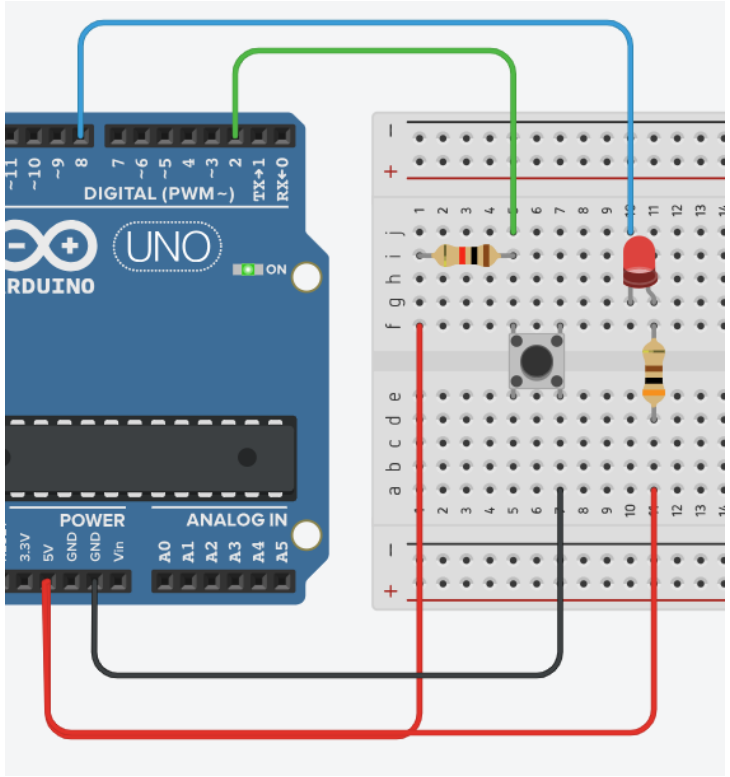




외부 인터럽트(External Interrupt)

- **폴링** vs 인터럽트

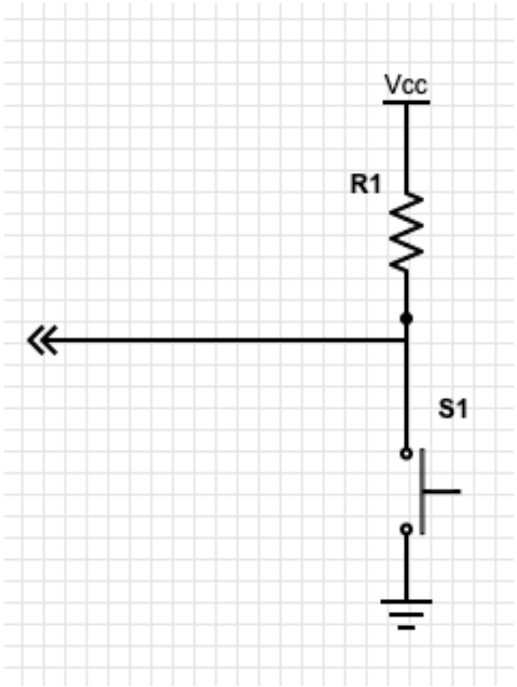


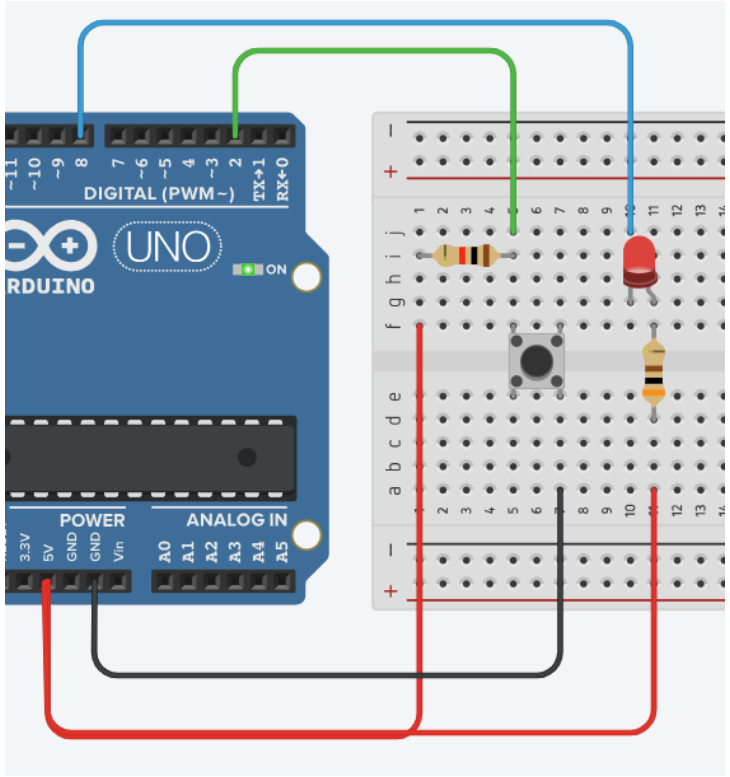



```
void setup()
{
  pinMode(2, INPUT) ;
  pinMode(8, OUTPUT) ;
}

void loop()
{
  int input = digitalRead(2) ;

  if( input == 0  )
  {
      digitalWrite(8, 0) ;
  }
  else
  {
       digitalWrite(8, 1) ;
  }
}
```

외부 인터럽트(External Interrupt)

- **폴링** vs 인터럽트

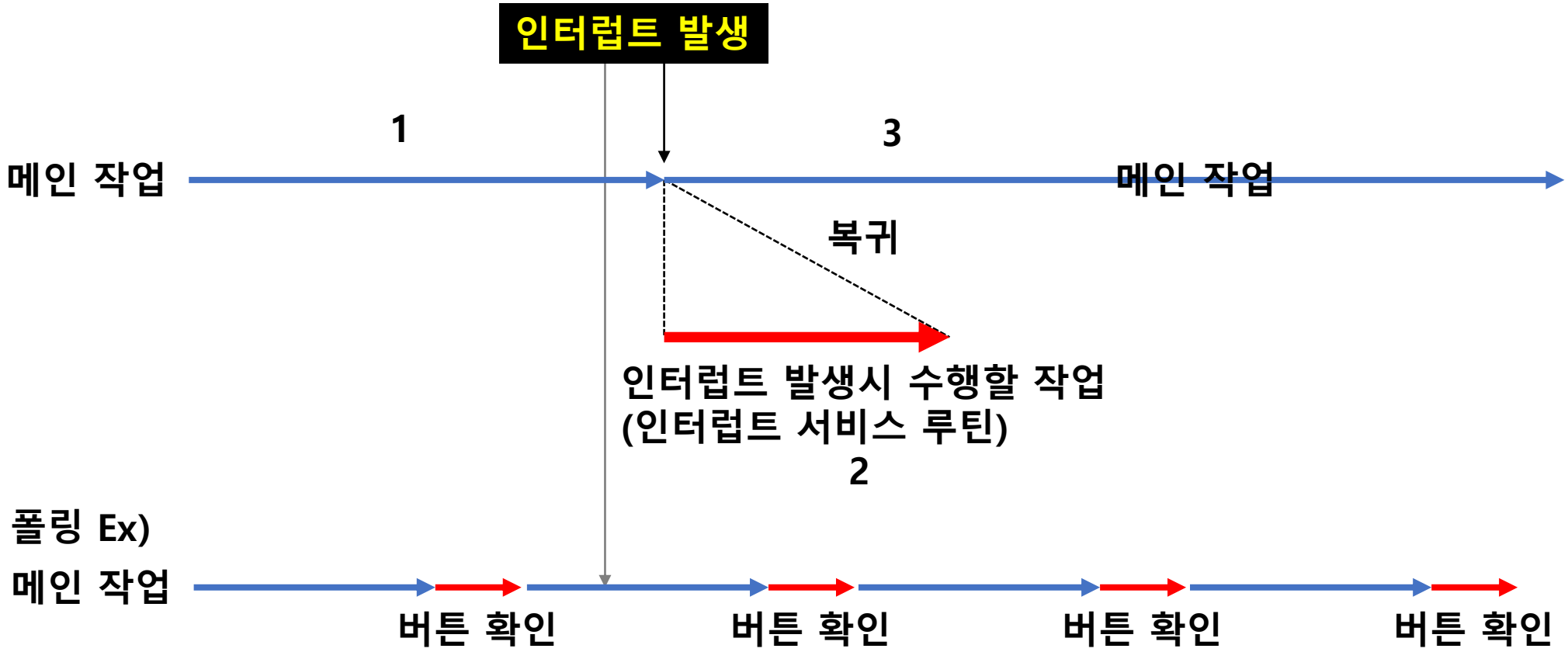





```
void setup()
{
  pinMode(2, INPUT) ;
  pinMode(8, OUTPUT) ;

  Serial.begin(9600) ;
}

void loop()
{

  digitalWrite(8, 0) ;
  delay(1000) ;

  digitalWrite(8, 1) ;
  delay(1000) ;

  int input = digitalRead(2) ;
  if( input == 0 )
  {
      Serial.println("key") ;
  }
}
```

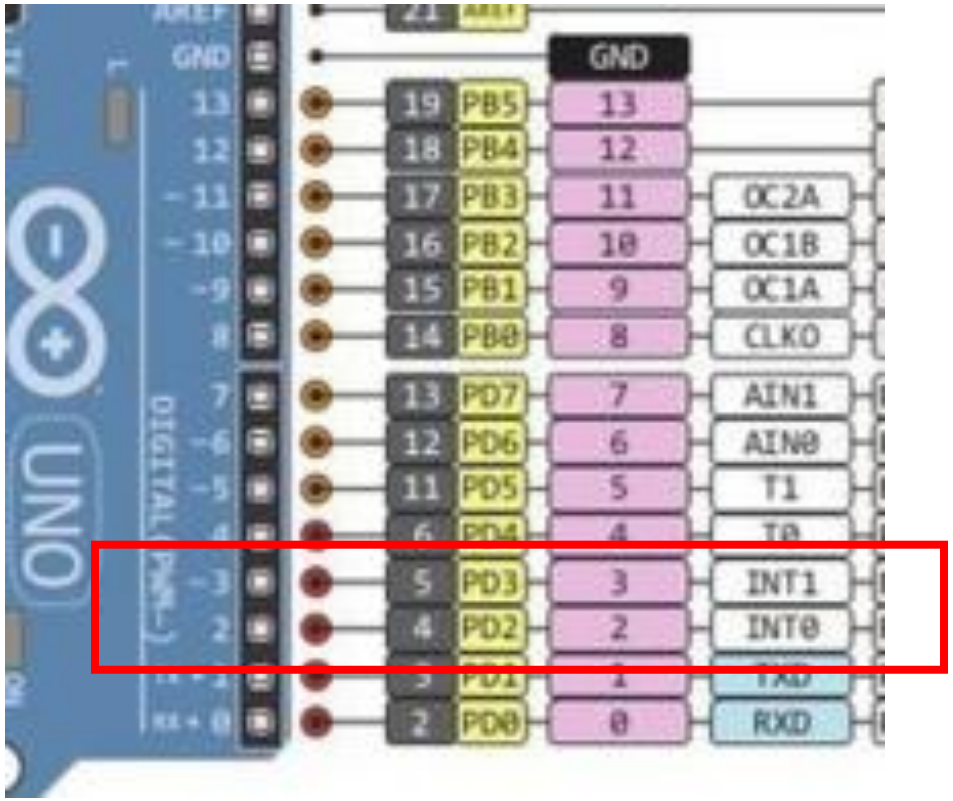
외부 인터럽트(External Interrupt)

- 폴링 vs **인터럽트**



외부 인터럽트(External Interrupt)

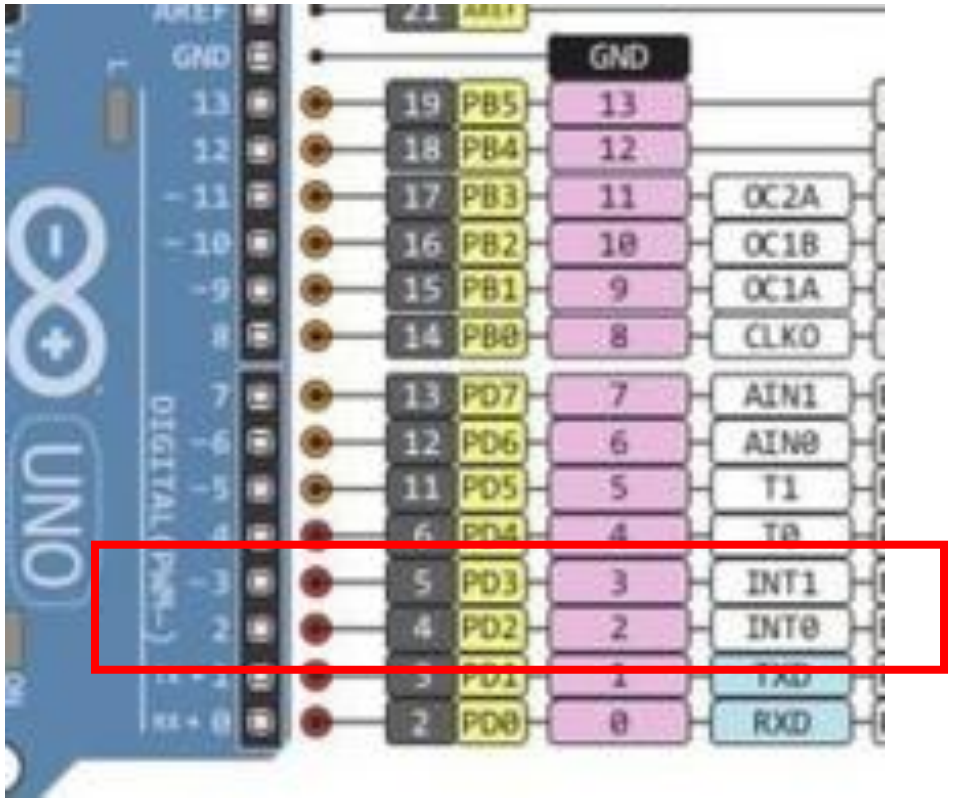
- 폴링 vs **인터럽트**



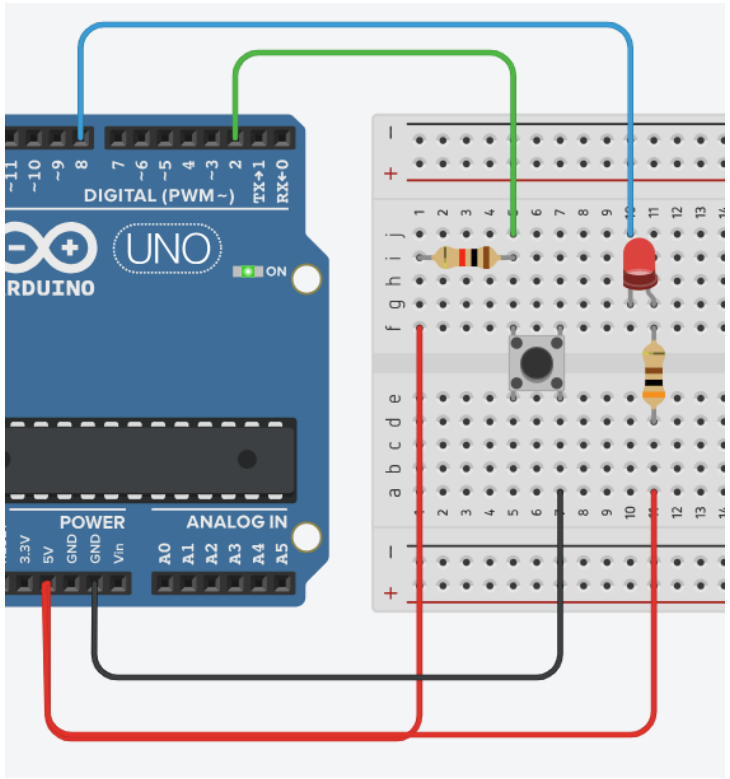
- **INT1 : Interrupt #1**
- **INT0 : Interrupt #0**

외부 인터럽트(External Interrupt)

- 폴링 vs **인터럽트**



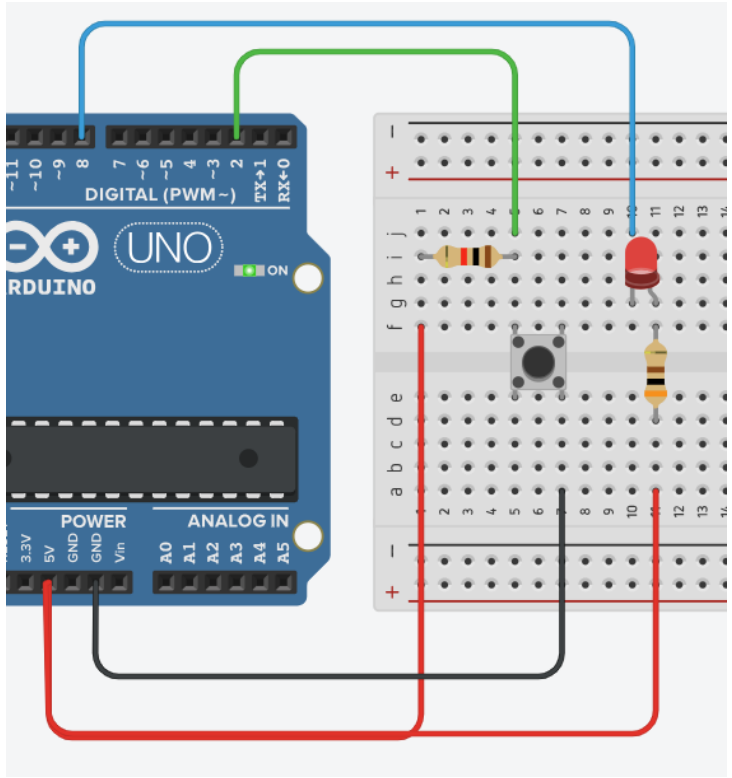
2 → INT0 : Interrupt #0



외부 인터럽트(External Interrupt)

- 폴링 vs **인터럽트**

2 → INT0 : Interrupt #0



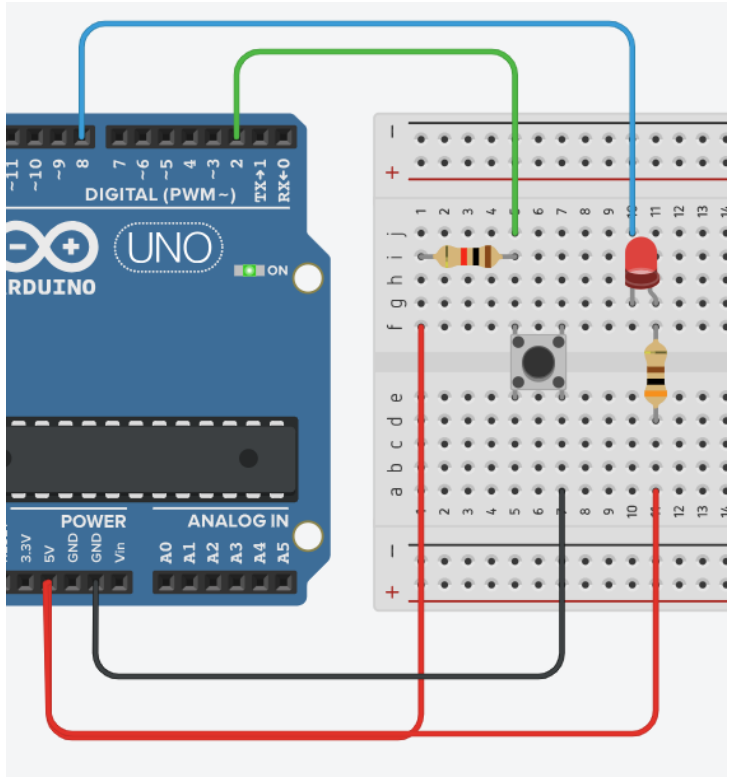
인터럽트 발동 조건 (mode)

모드	상태
LOW	핀이 LOW일때
CHANGE	LOW->HIGH or HIGH->LOW로 변할 때
RISING	LOW ->HIGH일때
FALLING	HIGH -> LOW일때
HIGH	핀이 HIGH일때

외부 인터럽트(External Interrupt)

- 폴링 vs **인터럽트**

2 → INT0 : Interrupt #0



attachInterrupt(digitalPinToInterrupt(핀번호), 서비스루틴함수명, 모드);

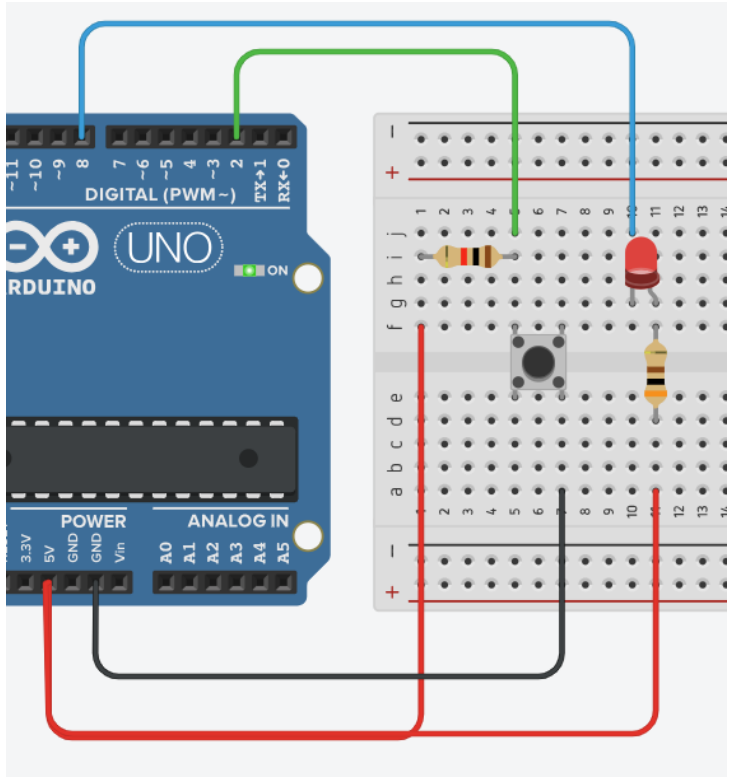
인터럽트 발동 조건 (mode)

모드	상태
LOW	**핀이 LOW일때**
CHANGE	**LOW->HIGH or HIGH->LOW로 변할 때**
RISING	**LOW ->HIGH일때**
FALLING	**HIGH -> LOW일때**
HIGH	**핀이 HIGH일때**

외부 인터럽트(External Interrupt)

- 폴링 vs **인터럽트**

2 → INT0 : Interrupt #0



attachInterrupt(digitalPinToInterrupt(2), ExINT, FALLING);

attachInterrupt(digitalPinToInterrupt(핀번호), 서비스루틴함수명, 모드);

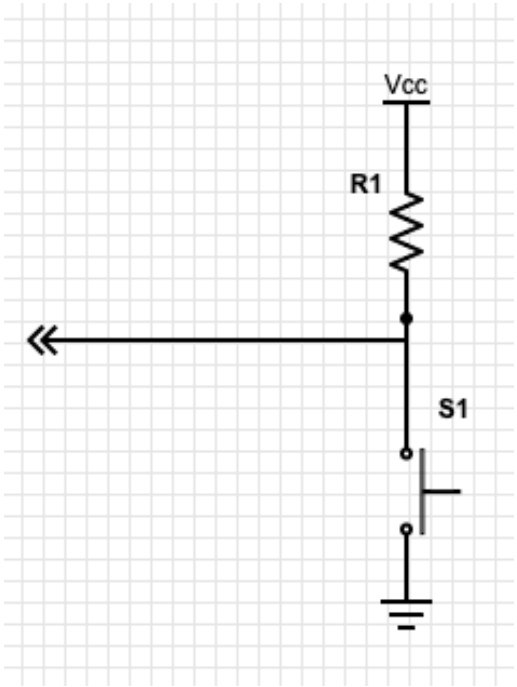
인터럽트 발동 조건 (mode)

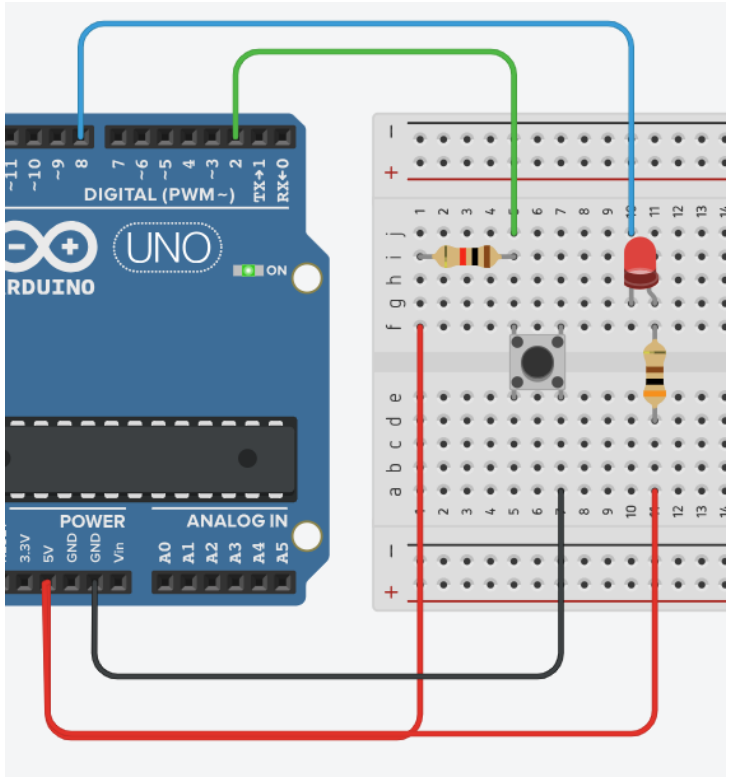
모드	상태
LOW	핀이 LOW일때
CHANGE	LOW->HIGH or HIGH->LOW로 변할 때
RISING	LOW ->HIGH일때
FALLING	HIGH -> LOW일때
HIGH	핀이 HIGH일때

외부 인터럽트(External Interrupt)

- 폴링 vs **인터럽트**

attachInterrupt(digitalPinToInterrupt(2), ExINT, FALLING);






```
void setup()
{
  pinMode(8, INPUT) ;
  pinMode(2, OUTPUT) ;

  attachInterrupt( digitalPinToInterrupt(2), ExINT, FALLING );

  Serial.begin(9600) ;
}

void loop()
{
  digitalWrite(8, 0) ;
  delay(1000) ;

  digitalWrite(8, 1) ;
  delay(1000) ;
}

void ExINT()
{
  Serial.println("ExINT") ;
}
```