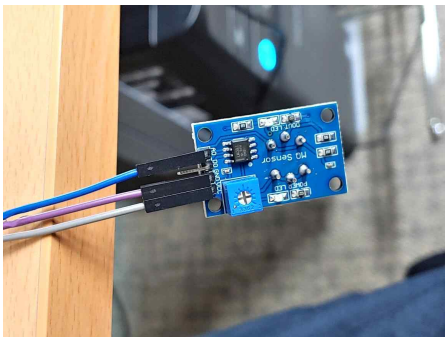
SPI 통신과 MQ3 센서 사용



<하드웨어>
[MQ-3 센서, 라즈베리파이3(raspberry pi B+)]
-MQ-3 센서의 DO는 쓰지 않으며 AO만 받는 다. DO는 뒤에 달려있는 가변저항상자의 기준치에 의해 Yes or No 로만 표현되는 출력이기 때문에 쓰지 않는 다.
-CNDI에서 지원해주는 기판에서 AO는 S, Vcc는 V, GND는 G에 연결해야 합니다. (Analog 0)

1. SPI 통신을 활성화
    1. sudo raspi-config
    2. 5.Interfacing Options
    3. SPI를 선택

2. sudo nano /etc/modules
    1.맨 아래에 spidev를 추가

3. 라이브러리 설치
    1. sudo apt-get install python-dev
    2. git clone git://github.com/Gadgetoid/py-spidev.git
    3. cd py-spidev/
    4. sudo python setup.py install

4. 센서 연결
   1. 채널 1번 (본 교재 기판의 Analog 0 과 동일)에다 끼우면 정상작동

5. 소스코드 (mcp.py)
<참조> :
https://m.blog.naver.com/PostView.nhn?blogId=roboholic84&logNo=220367321777&proxyReferer=https:%2F%2Fwww.google.com%2F

```python
import spidev, time

spi = spidev.SpiDev()
spi.open(0, 0)
spi.max_speed_hz = 1350000

def analog_read(channel):
      r = spi.xfer2([1, (8 + channel) << 4, 0])
      adc_out = ((r[1]&3) << 8) + r[2]
      return adc_out

while True:
      reading = analog_read(0)
      voltage = reading * 3.3 / 1024
      print("Reading=%d\tVoltage=%f" % (reading, voltage))
      time.sleep(2)
```

6.MariaDB 정의

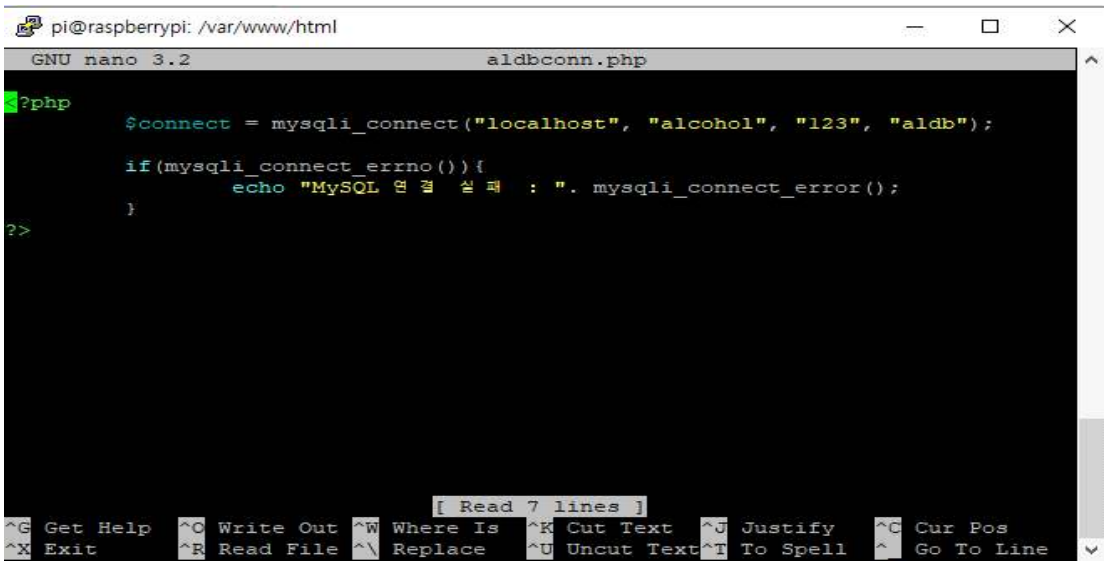
1. sudo mysql -u root -p (mysql 접속)
2. CREATE DATABASE aldb default CHARACTER SET UTF8;
3. use aldb default CHARACTER SET utf8mb4;
4. CREATE TABLE testal(
   -> _id INT PRIMARY KEY AUTO_INCREMENT,
   -> alc INT NOT NULL);
5. desc testal; (확인용)

7.DB 권한 부여

1. CREATE USER 'alcohol'@'%' IDENTIFIED BY '123';
2. GRANT ALL PRIVILEGES ON aldb.* TO 'smart'@'%';
3. FLUSH privileges;
4. exit

8. PHP를 이용한 mariadb 사용

1. cd /var/www/html
2. sudo nano aldbconn.php



3. sudo nano alselect.php

pi@raspberrypi: /var/www/html

```
 GNU nano 3.2                          alselect.php

<?php
        header("Content-Type: text/html; charset=UTF-8");

        include "./aldbconn.php";

        $sql = "SELECT * FROM testal";

        $result = mysqli_query($connect, $sql);
        $runners = array();

        while($row = mysqli_fetch_array($result) ){
                echo $row['_id'].", ";
                echo $row['alc']."<br>";
        }

        mysqli_close($connect);
?>


                              [ Read 17 lines ]
^G Get Help  ^O Write Out ^W Where Is  ^K Cut Text  ^J Justify   ^C Cur Pos
^X Exit      ^R Read File ^\ Replace   ^U Uncut Text^T To Spell  ^_ Go To Line
```

4. sudo nano alinsert.html

pi@raspberrypi: /var/www/html

```
 GNU nano 3.2                          alinsert.html

<!doctype html>
<html lang="en">
<head>
        <meta charset="UTF-8">
<title>INSERT TEST</title>
</head>

<body>
        <form action="alinsert_post.php" method="post">
                alcohol : <input type="text" name="alc"><br>
                <input type="submit">
        </form>
</body>
</html>




                              [ Read 14 lines ]
^G Get Help  ^O Write Out ^W Where Is  ^K Cut Text  ^J Justify   ^C Cur Pos
^X Exit      ^R Read File ^\ Replace   ^U Uncut Text^T To Spell  ^_ Go To Line
```

5. sudo nano alinsert_post.php

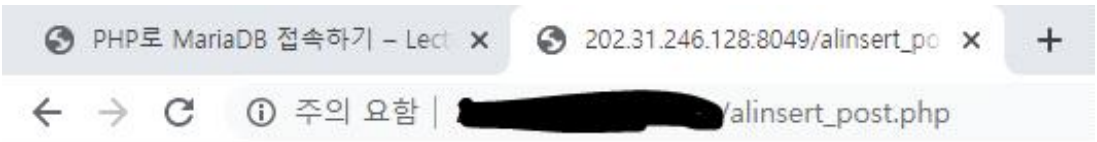
pi@raspberrypi: /var/www/html

```
 GNU nano 3.2                    alinsert_post.php

<?php
        header("Content-Type: text/html; charset=UTF-8");


        include "./aldbconn.php";

        $alc = $_POST['alc'];

        $sql = "INSERT INTO testal(alc) VALUES ('"
                                .$alc."');";

        $result = mysqli_query($connect, $sql);
        mysqli_close($connect);

        echo $sql;
        echo $result."저 장 되 었 습 니 다 .";
?>


                        [ Read 17 lines ]
^G Get Help  ^O Write Out ^W Where Is  ^K Cut Text  ^J Justify   ^C Cur Pos
^X Exit      ^R Read File ^\ Replace   ^U Uncut Text^T To Spell  ^_ Go To Line
```

9. 인터넷을 킨 후 접속 (테스트 해보는 용도입니다.)
   1. http://자신의 ip주소/alselect.php

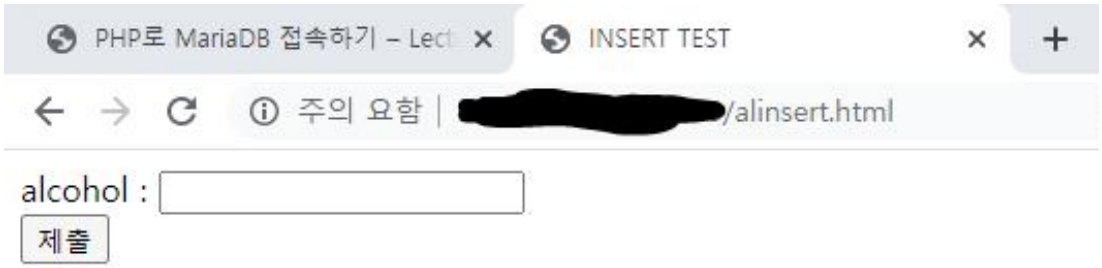
1, 100
2, 400
3, 90
4, 106
5, 102
6, 82

   2. http://자신의 ip주소/alinsert.html

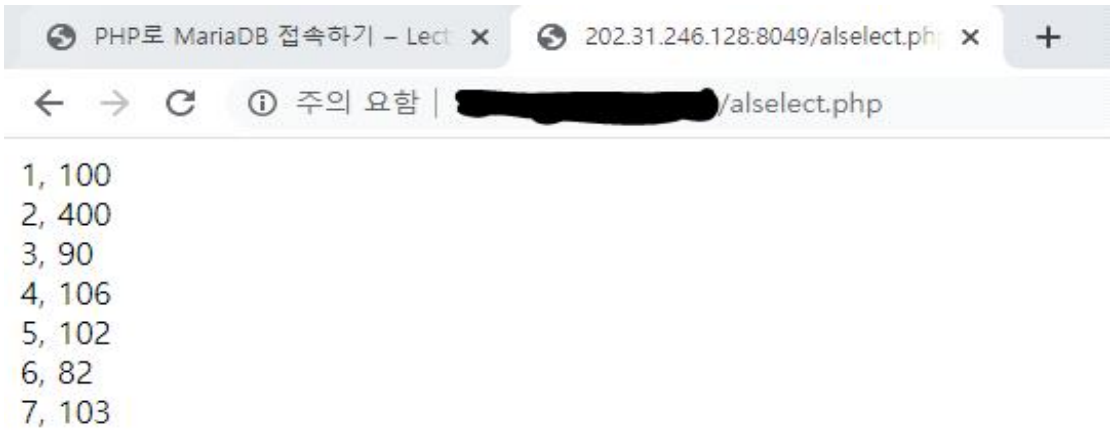


INSERT INTO testal(alc) VALUES ('103');1저장되었습니다.

3. 임의의 값을 입력 (ex: 103)



4. http://자신의 ip주소/alselect.php
   해당 사진에서 마지막 7번째에 103이 들어간 것을 알 수 있음.



10. 작동 파일 작성
    1. cd ~
    2. nano mq3data.py (새로 추가된 코드는 **Bald 표시**)

```python
import time
import spidev
import pymysql

spi = spidev.SpiDev()
spi.open(0, 0)
spi.max_speed_hz = 1350000

def analog_read(channel):
        r = spi.xfer2([1, (8 + channel) << 4, 0])
        adc_out = ((r[1]&3) << 8) + r[2]
        return adc_out

def insertDB(reading):
    conn = pymysql.connect(host='localhost', user='alcohol', password='123',
                    db='aldb', charset='utf8')

    with conn.cursor() as cursor:
        sql = 'insert into testal(alc) values(%s);'
        cnt = cursor.execute(sql, (reading))
        r = conn.commit()

        if r == 0:
            print("Failed")
        else:
            print("Save Ok")

    conn.close()

while True:
        reading = analog_read(0)
        voltage = reading * 3.3 / 1024
        print("Reading=%d\tVoltage=%f" % (reading, voltage))
        insertDB(reading)
        time.sleep(15)
```

11. ThingSpeak 연동
    1. URL: http://www.thingspeak.com
    2. 무료 사용자는 15초 단위로 데이터를 입력 할 수 있음.
    3. 자신의 채널을 만들고, 필드1만 만든다.
    4. API Keys
    5. [Write API Key]에 있는 글자를 복사한다.

12. 완성 코드 (PHP코드는 **Bald,** Thingspeak는 주황색)

```python
import time
import spidev
import urllib.request
import pymysql

spi = spidev.SpiDev()
spi.open(0, 0)
spi.max_speed_hz = 1350000

def analog_read(channel):
        r = spi.xfer2([1, (8 + channel) << 4, 0])
        adc_out = ((r[1]&3) << 8) + r[2]
        return adc_out


def insertDB(reading):
    conn = pymysql.connect(host='localhost', user='alcohol', password='123',
                    db='aldb', charset='utf8')

    with conn.cursor() as cursor:
         sql = 'insert into testal(alc) values(%s);'
         cnt = cursor.execute(sql, (reading))
         r = conn.commit()

         if r == 0:
             print("Failed")
         else:
             print("Save Ok")

    conn.close()

def insertCloud(reading):
         api_key = '###############'
         url = 'https://api.thingspeak.com/update'
         url = url + '?api_key=%s' % api_key
         url = url + '&field1=%s' % reading

         urllib.request.urlopen(url)

while True:
        reading = analog_read(0)
        voltage = reading * 3.3 / 1024
        print("Reading=%d\tVoltage=%f" % (reading, voltage))
        insertCloud(reading)
        insertDB(reading)
        time.sleep(15)
```

13. 결과
    1. python3 mq3data.py

    2. 술이나 손소독제를 갖다 대면 Reading 값이 올라가는 것을 관찰 할 수 있다.

```
pi@raspberrypi:~ $ python3 mq3data.py
Reading=192     Voltage=0.618750
Save Ok
Reading=160     Voltage=0.515625
Save Ok
```