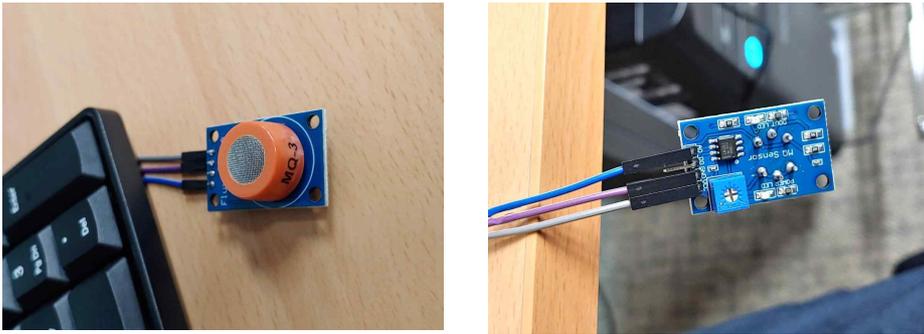


SPI 통신과 MQ3 센서 사용



<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 않는다.

-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 `spidev`를 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>

```

1  import spidev, time
2
3  spi = spidev.SpiDev()
4  spi.open(0, 0)
5  spi.max_speed_hz = 1350000
6
7  def analog_read(channel):
8      r = spi.xfer2([1, (8 + channel) << 4, 0])
9      adc_out = ((r[1]&3) << 8) + r[2]
10     return adc_out
11
12     while True:
13         reading = analog_read(0)
14         voltage = reading * 3.3 / 1024
15         print("Reading=%d\tVoltage=%f" % (reading, voltage))
16         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

```

pi@raspberrypi: /var/www/html
GNU nano 3.2 aldbconn.php
?php
    $connect = mysqli_connect("localhost", "alcohol", "123", "aldb");

    if(mysqli_connect_errno()){
        echo "MySQL 연결 실패 : ". mysqli_connect_error();
    }
?>
[ Read 7 lines ]
^G Get Help  ^C Write Out  ^W Where Is  ^K Cut Text  ^J Justify    ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text ^I To Spell  ^_ Go To Line

```

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

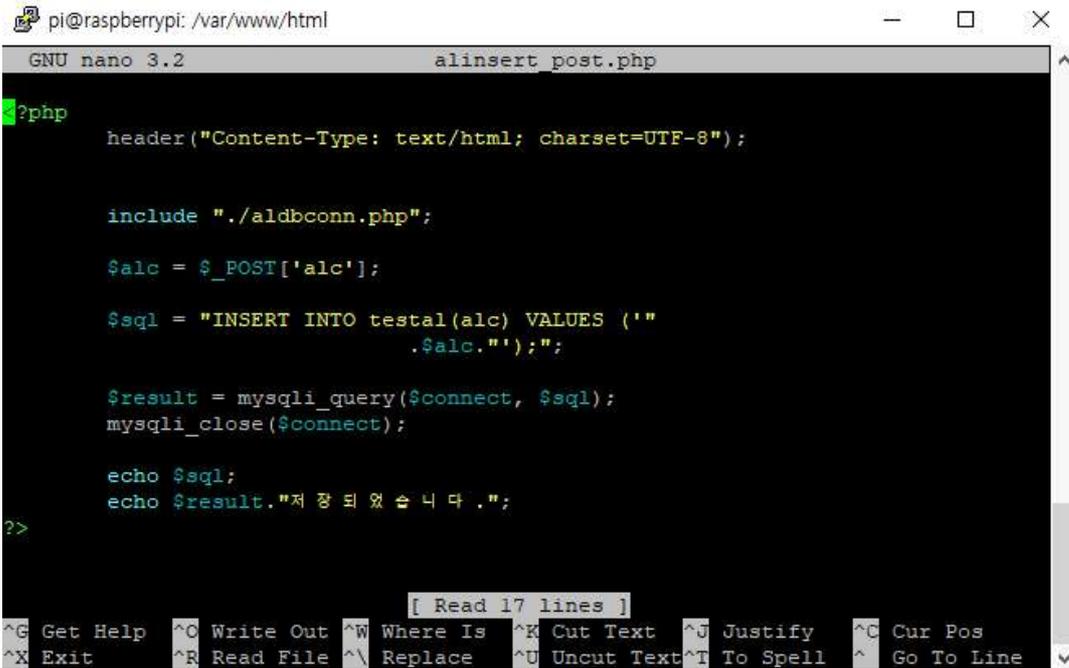
4. sudo nano alinsert.html

```
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'];

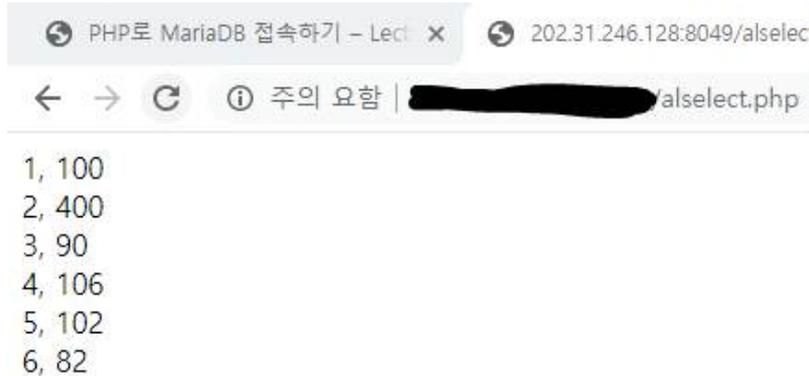
$sql = "INSERT INTO testal(alc) VALUES ('"
      . $alc . "')";

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

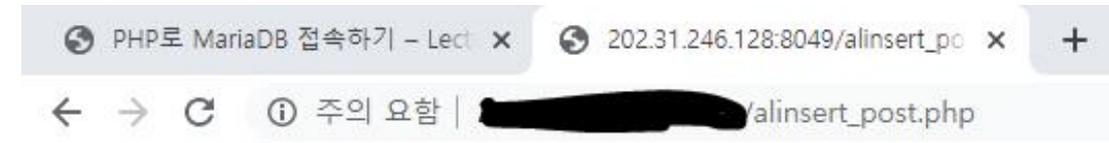
echo $sql;
echo $result."저장되었습니다.";
?>
[ Read 17 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

9. 인터넷을 켜고 접속 (테스트 해보는 용도입니다.)

1. http://자신의 ip주소/alselect.php

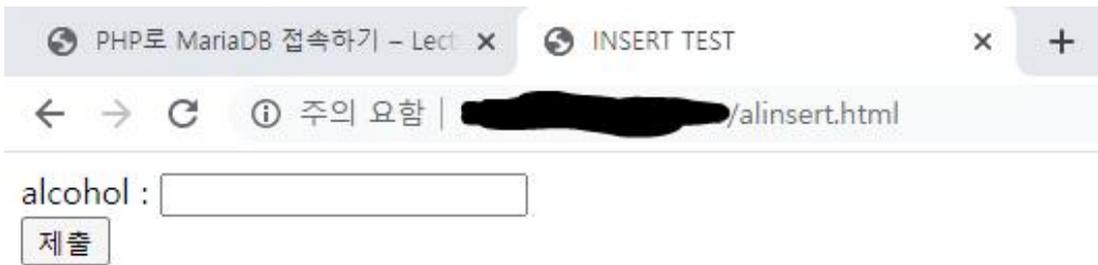


2. http://자신의 ip주소/alinsert.html



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

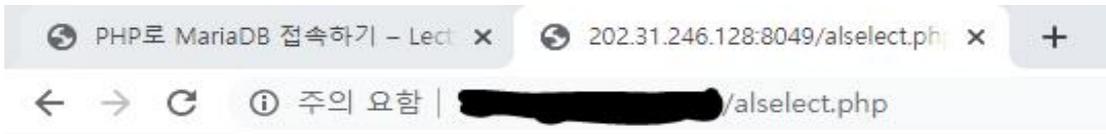
3. 임의의 값을 입력 (ex: 103)



The screenshot shows a web browser with two tabs: 'PHP로 MariaDB 접속하기 - Lect' and 'INSERT TEST'. The address bar contains a URL with a redacted IP address followed by '/alinsert.html'. Below the address bar, there is a form with the label 'alcohol :' and an empty text input field. A button labeled '제출' (Submit) is located below the input field.

4. http://자신의 ip주소/alselect.php

해당 사진에서 마지막 7번째에 103이 들어간 것을 알 수 있음.



The screenshot shows a web browser with two tabs: 'PHP로 MariaDB 접속하기 - Lect' and '202.31.246.128:8049/alselect.php'. The address bar contains a URL with a redacted IP address followed by '/alselect.php'. Below the address bar, there is a list of data:

1, 100
2, 400
3, 90
4, 106
5, 102
6, 82
7, 103

10. 작동 파일 작성

1. cd ~
2. nano mq3data.py (새로 추가된 코드는 Bald 표시)

```
1 import time
2 import spidev
3 import pymysql
4
5 spi = spidev.SpiDev()
6 spi.open(0, 0)
7 spi.max_speed_hz = 1350000
8
9 def analog_read(channel):
10     r = spi.xfer2([1, (8 + channel) << 4, 0])
11     adc_out = ((r[1]&3) << 8) + r[2]
12     return adc_out
13
14 def insertDB(reading):
15     conn = pymysql.connect(host='localhost', user='alcohol', password='123',
16                             db='aldb', charset='utf8')
17
18     with conn.cursor() as cursor:
19         sql = 'insert into testal(alc) values(%s);'
20         cnt = cursor.execute(sql, (reading))
21         r = conn.commit()
22
23         if r == 0:
24             print("Failed")
25         else:
26             print("Save Ok")
27
28     conn.close()
29
30 while True:
31     reading = analog_read(0)
32     voltage = reading * 3.3 / 1024
33     print("Reading=%d\tVoltage=%f" % (reading, voltage))
34     insertDB(reading)
35     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)

```
1 import time
2 import spidev
3 import urllib.request
4 import pymysql
5
6 spi = spidev.SpiDev()
7 spi.open(0, 0)
8 spi.max_speed_hz = 1350000
9
10 def analog_read(channel):
11     r = spi.xfer2([1, (8 + channel) << 4, 0])
12     adc_out = ((r[1]&3) << 8) + r[2]
13     return adc_out
14
15
16 def insertDB(reading):
17     conn = pymysql.connect(host='localhost', user='alcohol', password='123',
18                             db='aldb', charset='utf8')
19
20     with conn.cursor() as cursor:
21         sql = 'insert into testal(alc) values(%s);'
22         cnt = cursor.execute(sql, (reading))
23         r = conn.commit()
24
25         if r == 0:
26             print("Failed")
27         else:
28             print("Save Ok")
29
30     conn.close()
31
32 def insertCloud(reading):
33     api_key = '#####'
34     url = 'https://api.thingspeak.com/update'
35     url = url + '?api_key=%s' % api_key
36     url = url + '&field1=%s' % reading
37
38     urllib.request.urlopen(url)
39
40 while True:
41     reading = analog_read(0)
42     voltage = reading * 3.3 / 1024
43     print("Reading=%d\tVoltage=%f" % (reading, voltage))
44     insertCloud(reading)
45     insertDB(reading)
46     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
```