Raspberry Pi+PHP + MySQL + HC-SR04

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Installing Operation System Image

1. Download the image :

Official images for recommended operating systems are available to download from the Raspberry Pi website http://www.raspberrypi.org/downloads/
Index of images: http://downloads.raspberrypi.org/

2.Write an image to the SD card:

You need to use an image writing tool to install it on your SD card.

Installing Operation System Image

Image writing tools :

1.Linux:
https://www.raspberrypi.org/documentation/installation/installing-images/linux.md

2.Mac OS:
https://www.raspberrypi.org/documentation/installation/installing-images/mac.md

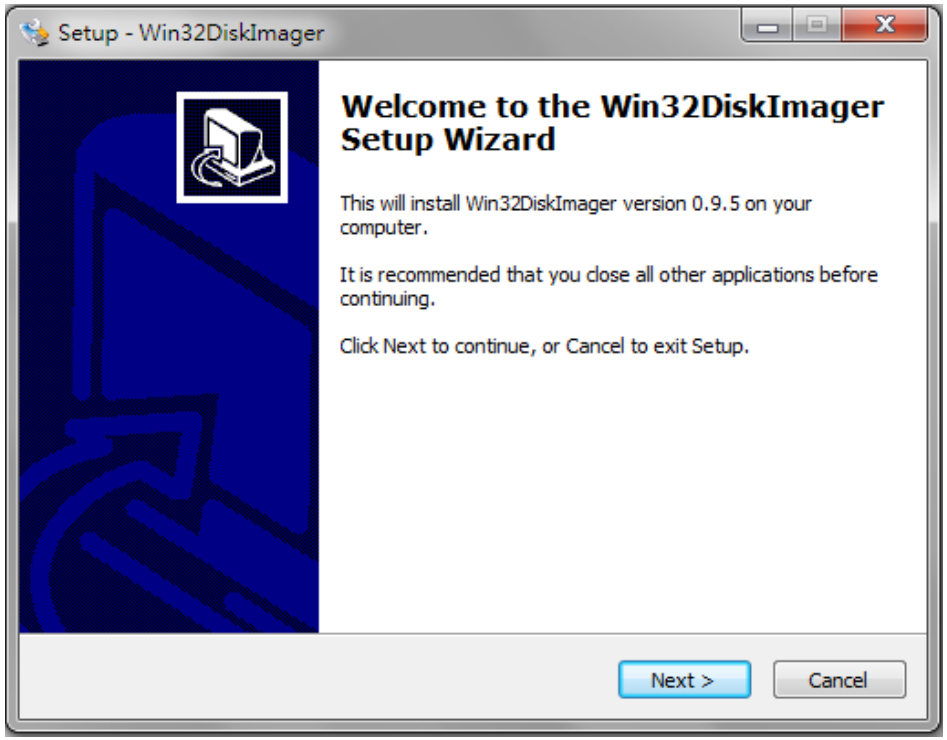
3.Windows:
https://www.raspberrypi.org/documentation/installation/installing-images/windows.md

Installing Operation System Image

Using Windows:

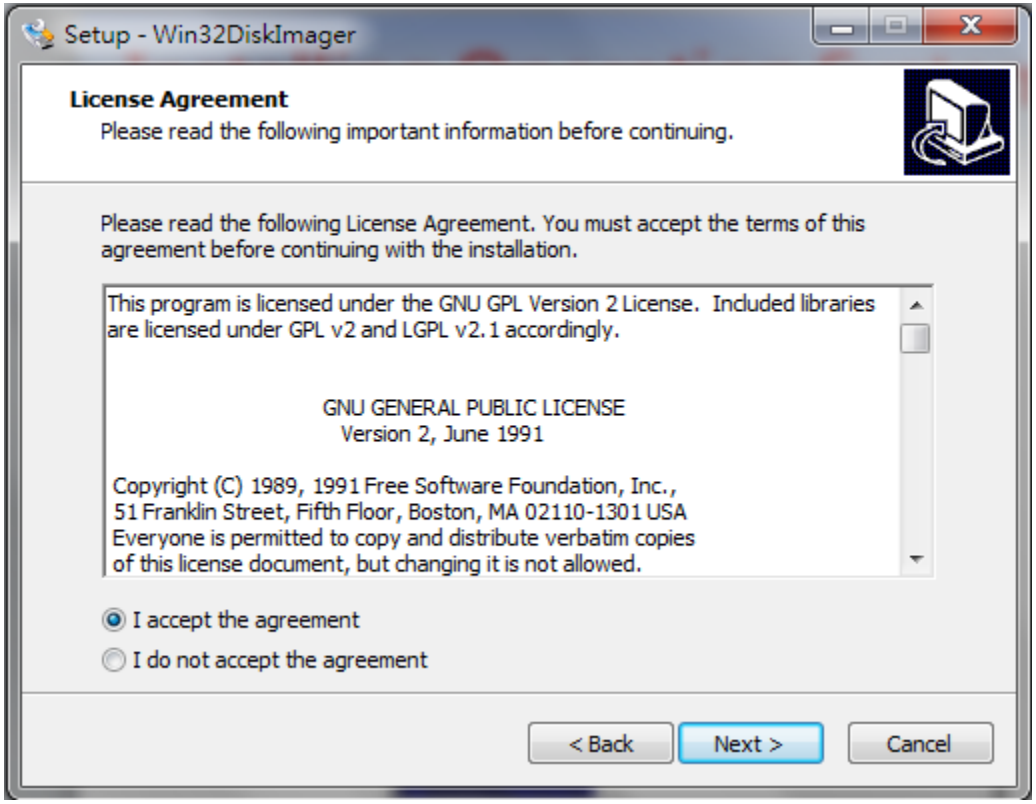
- Download and install the Win32DiskImager utility

https://sourceforge.net/projects/win32diskimager/



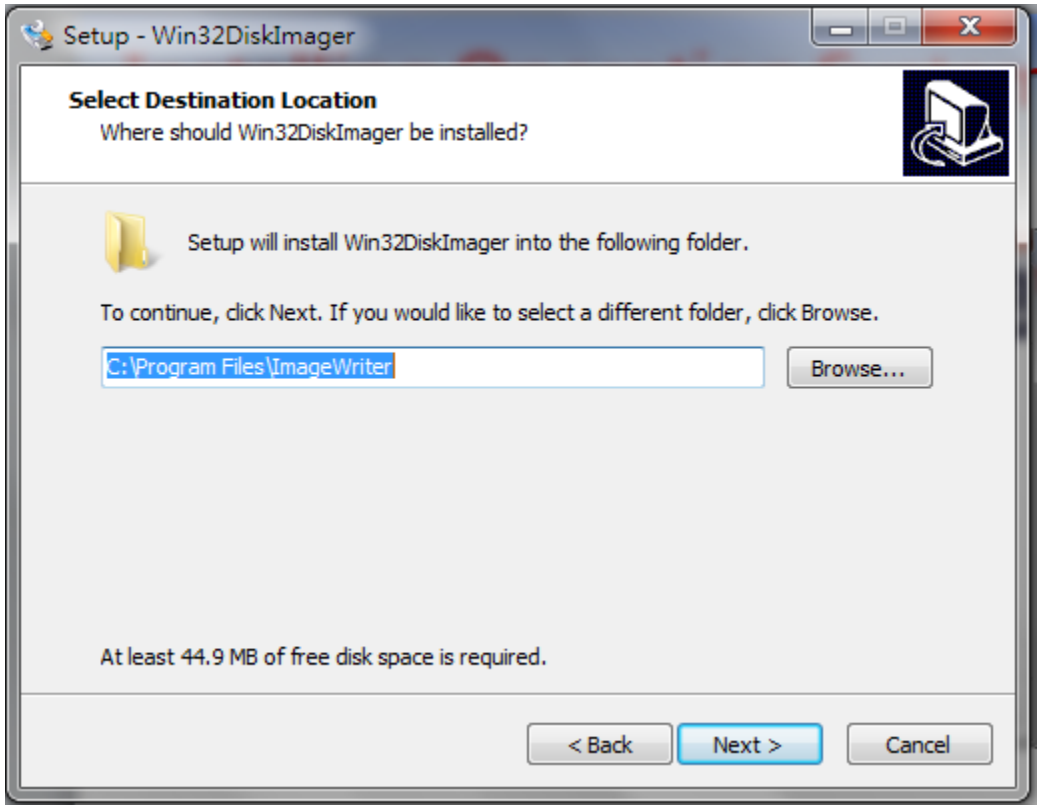
Installing Operation System Image

Install Win32DiskImager



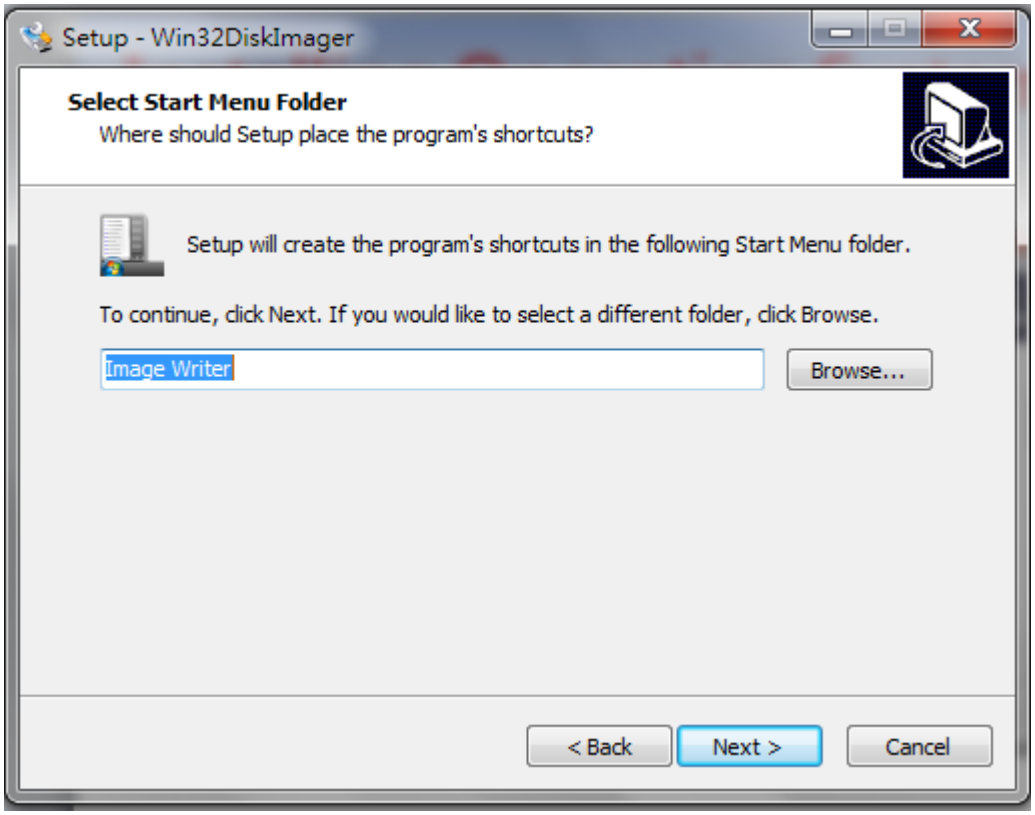
Installing Operation System Image

Install Win32DiskImager



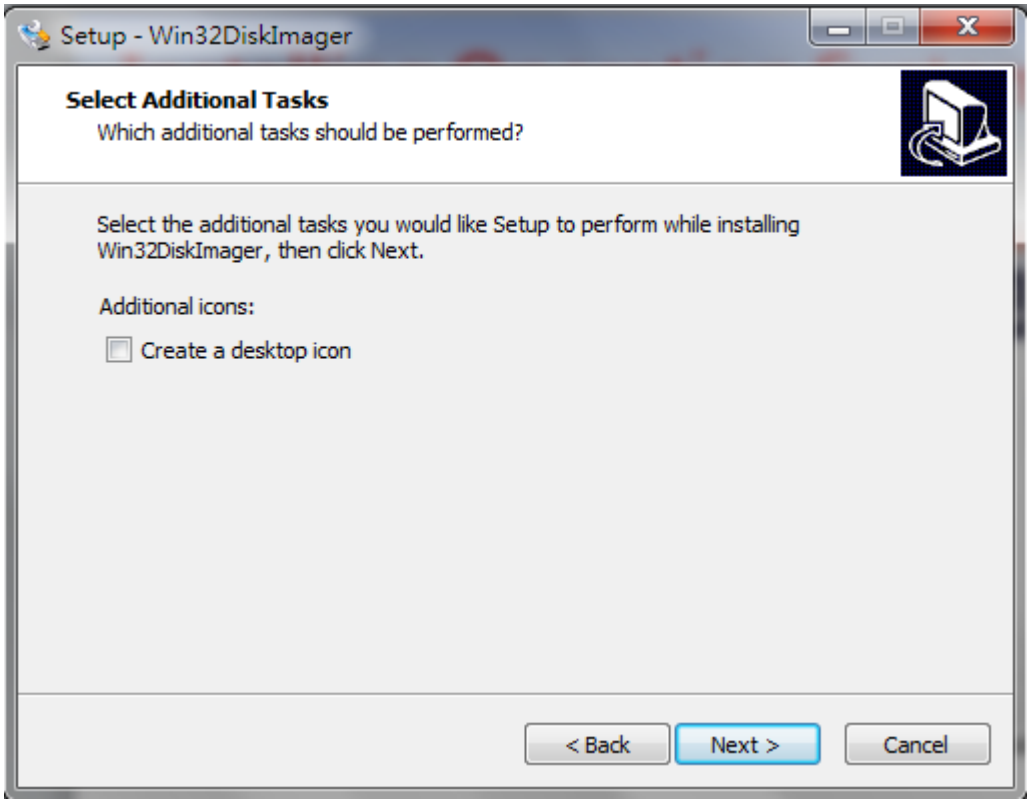
Installing Operation System Image

Installing Win32DiskImager



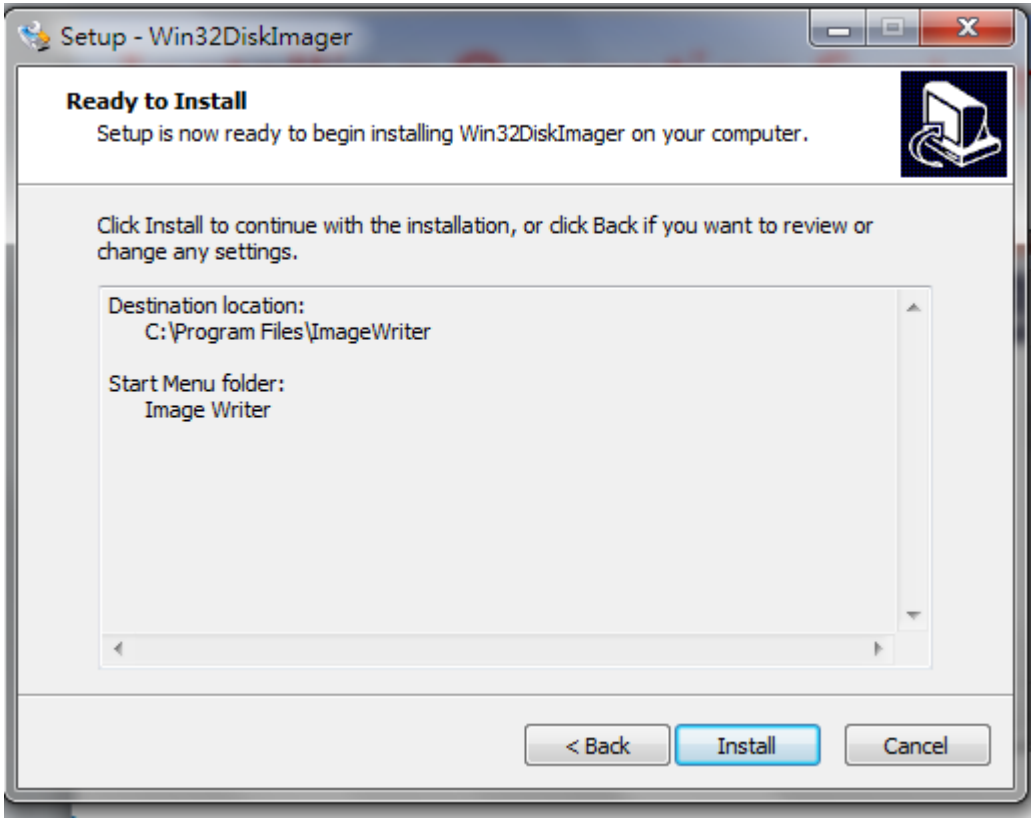
Installing Operation System Image

Installing Win32DiskImager



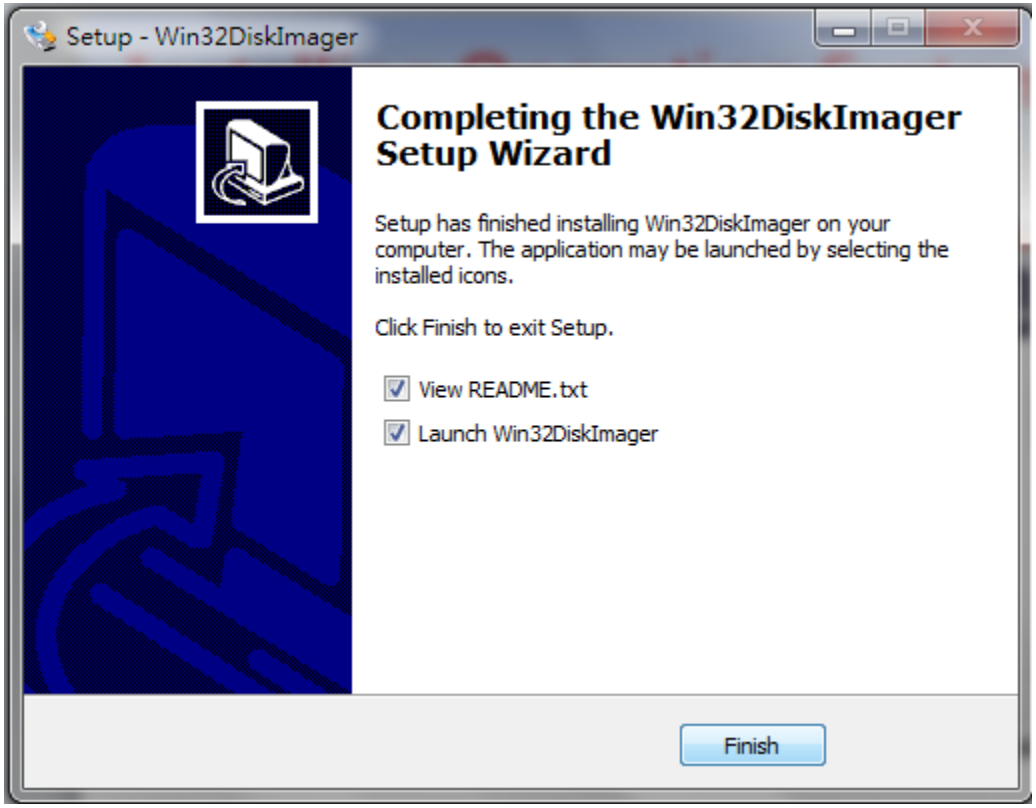
Installing Operation System Image

Install Win32DiskImager



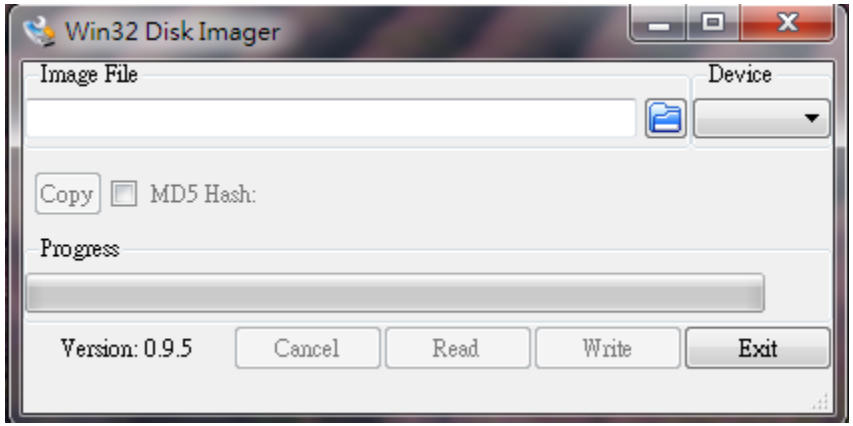
Installing Operation System Image

Install Win32DiskImager



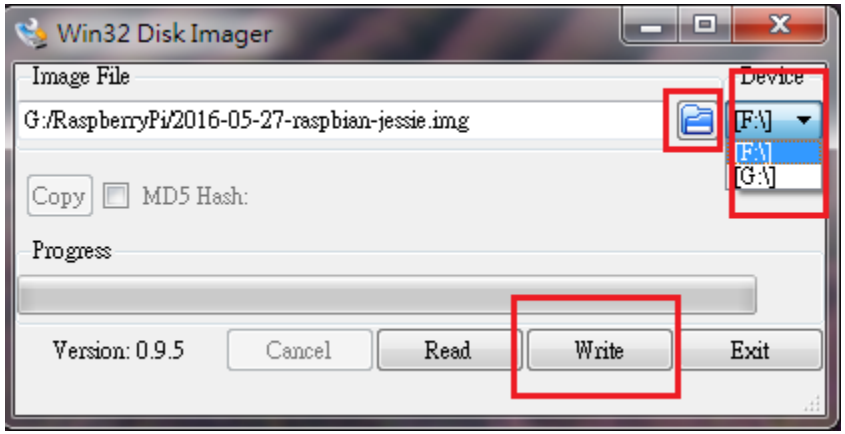
Installing Operation System Image

Launch Win32DiskImager



Installing Operation System Image

Select the Image ; Select the Device ; press [Write]



Pi 3 serial port error

*Need to disable Bluetooth

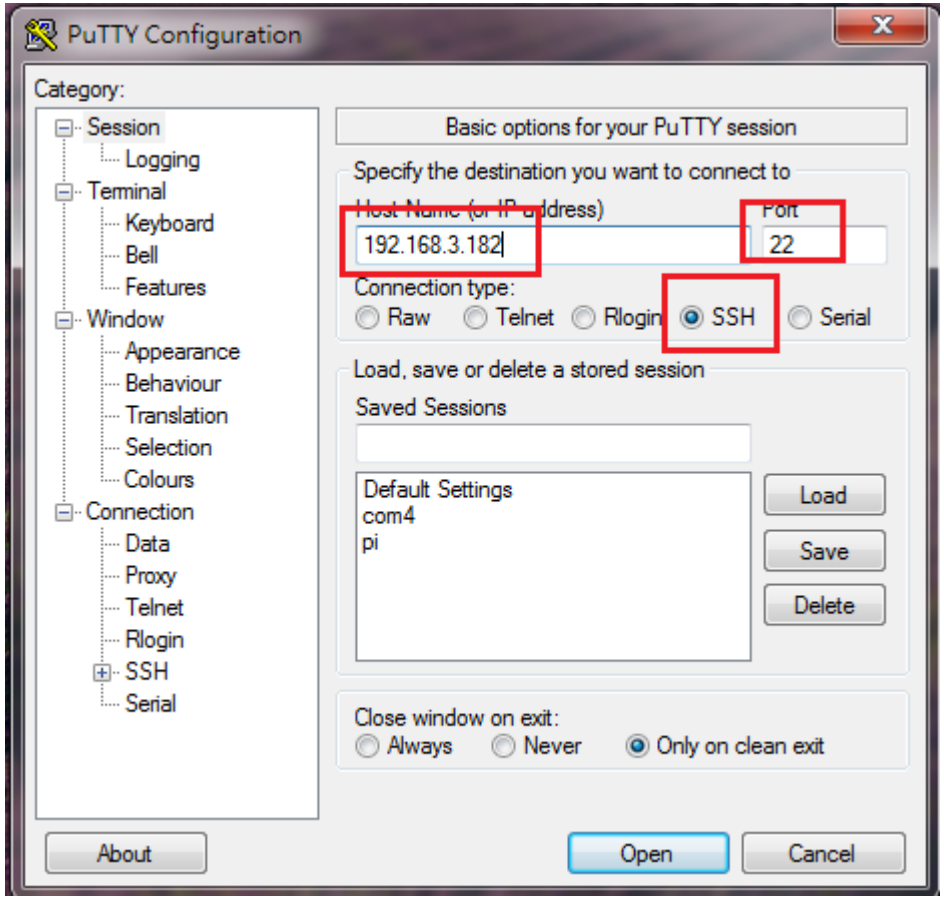
Booting

Config and Connect to Pi

1. Check the ip

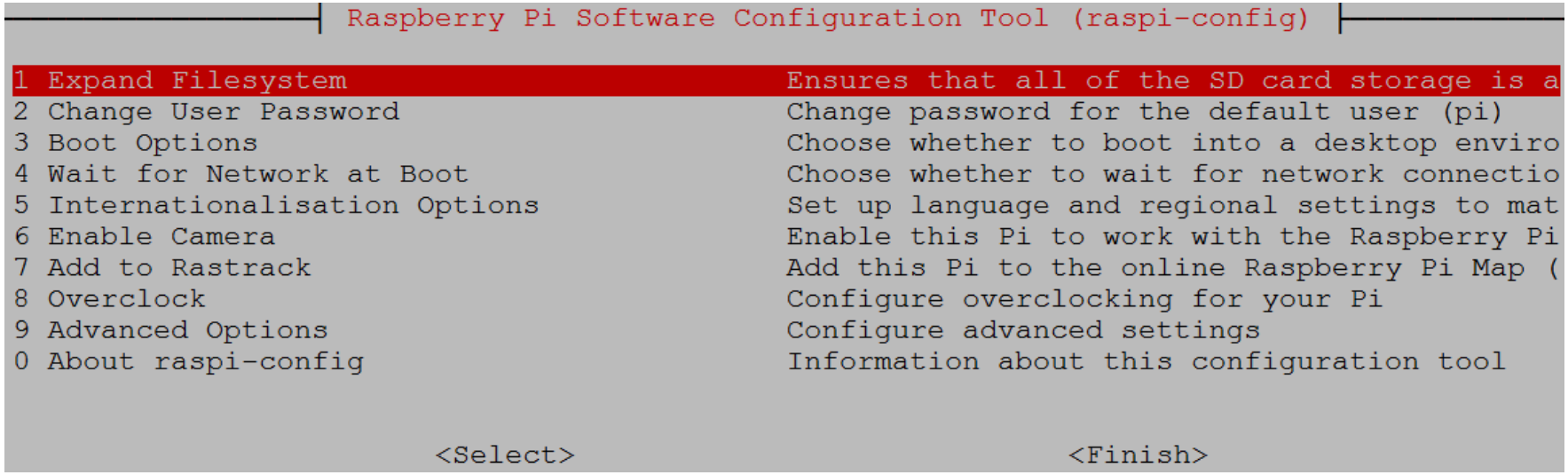
2. Connect to Pi by Putty

3. $ sudo raspi-config



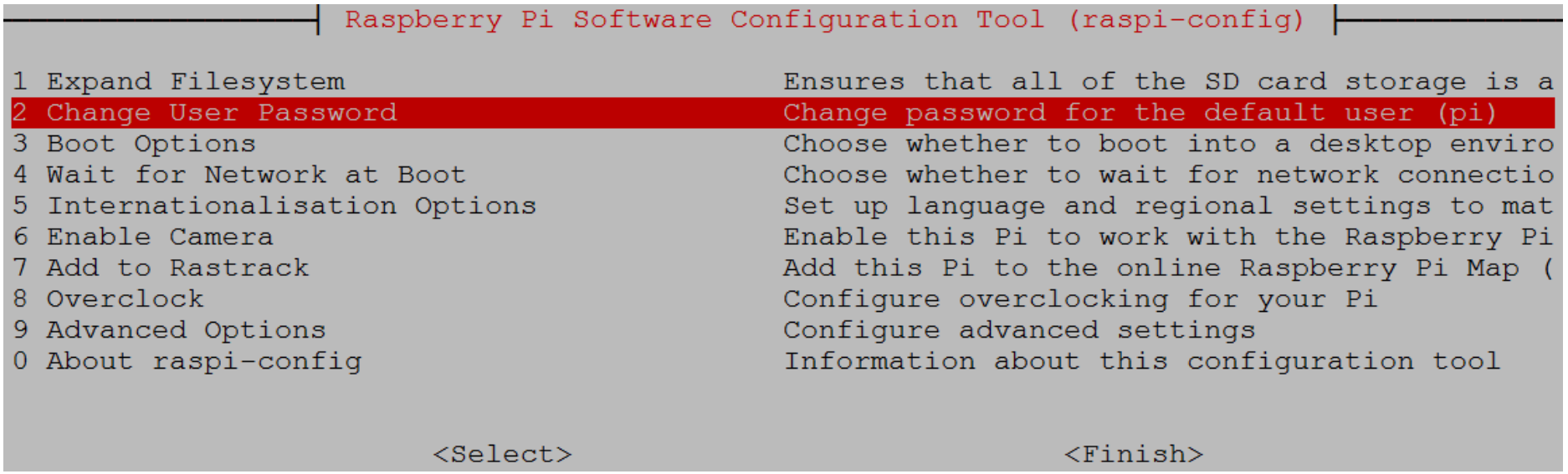
Config

Expand Filesystem



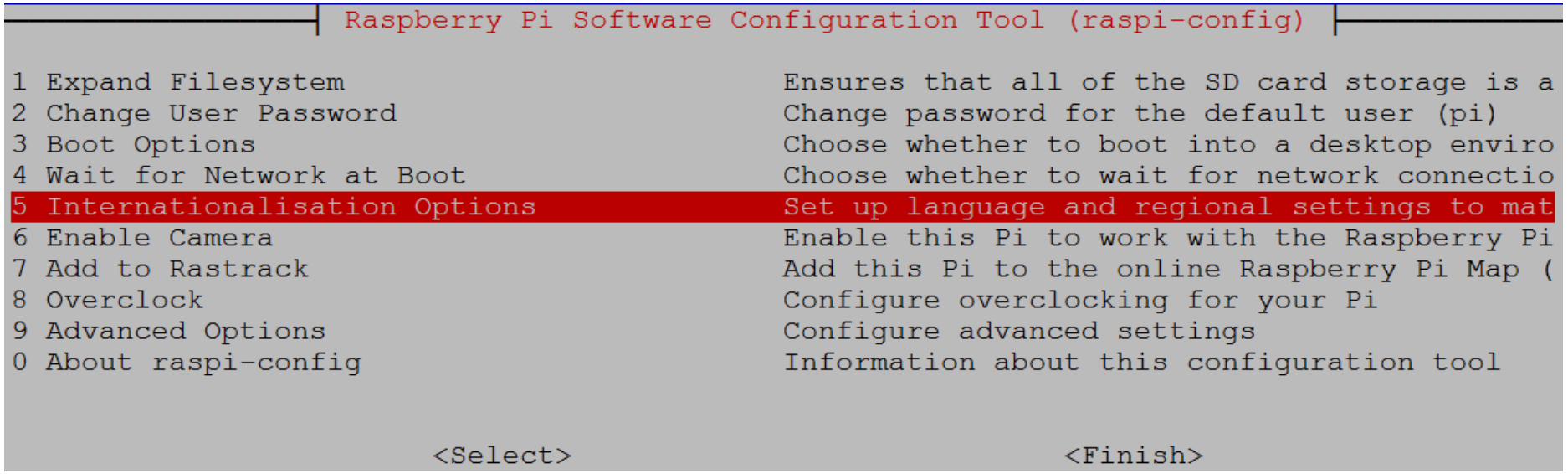
Config

Change User Password



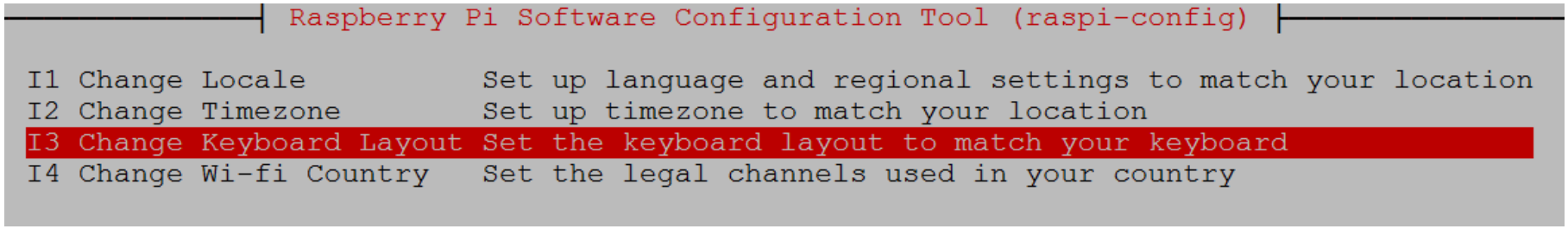
Config

Internationalisation Options



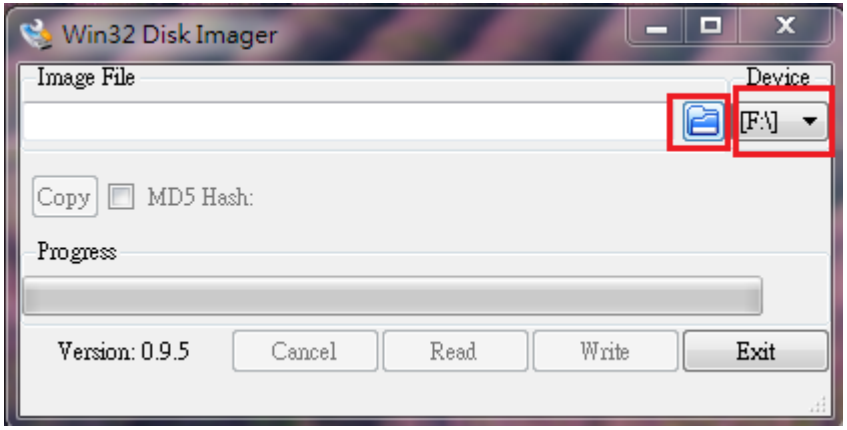
Config

Keyboard layout



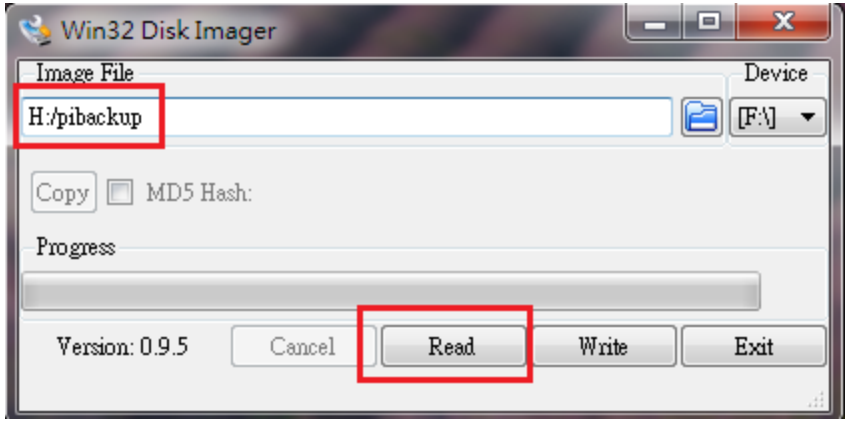
BackUp Operation System

Select the Device ; Give the location and a filename



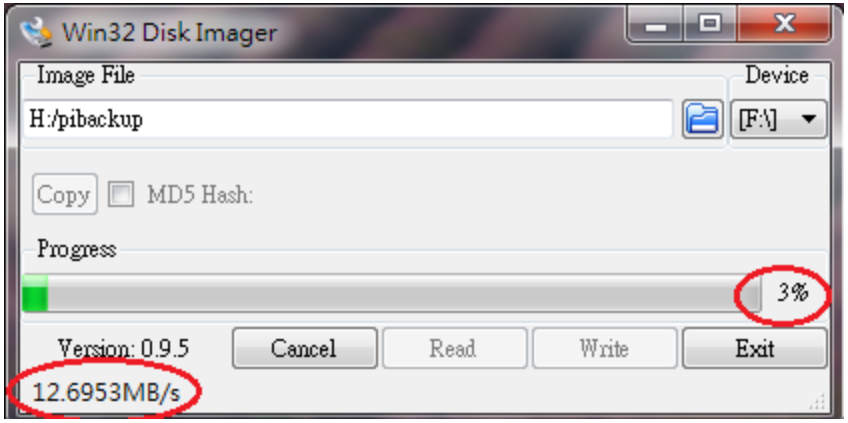
BackUp Operation System

Press [Read]



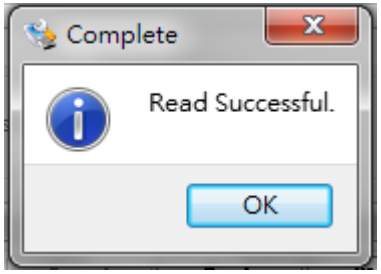
BackUp Operation System

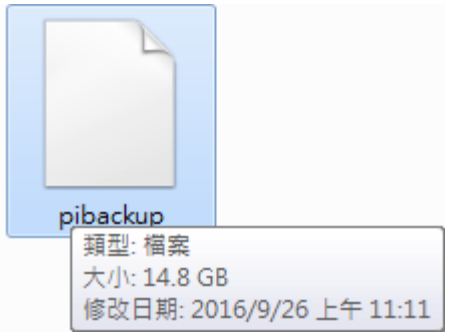
Reading...



BackUp Operation System

Done





LAMP Server

LAMP : Linux + Apache + MySQL + PHP

1. Install Apache+PHP

```
$ sudo apt-get update
$ sudo apt-get upgrade
$ sudo apt-get install apache2 php5 libapache2-mod-php5
```

2. Install vim

```
$ sudo apt-get install vim
```

3. Modify DocumentRoot

```
$ sudo vim /etc/apache2/sites-enabled/000-default.conf
```

[DocumentRoot /var/www/html] ->[DocumentRoot /var/www]
then remove the # symbol of this line :
[#Include conf-enabled/serve-cgi-bin.conf]

LAMP Server

4. Modify serve-cgi-bin.conf to enable cgi

$ sudo vim /etc/apache2/conf-available/serve-cgi-bin.conf

```
<Directory  "/usr/lib/cgi-bin"  >
                        AllowOverride  None

<Directory  "/usr/lib/cgi-bin"  >
                        AllowOverride  All
```

5. Restart Apache2 server

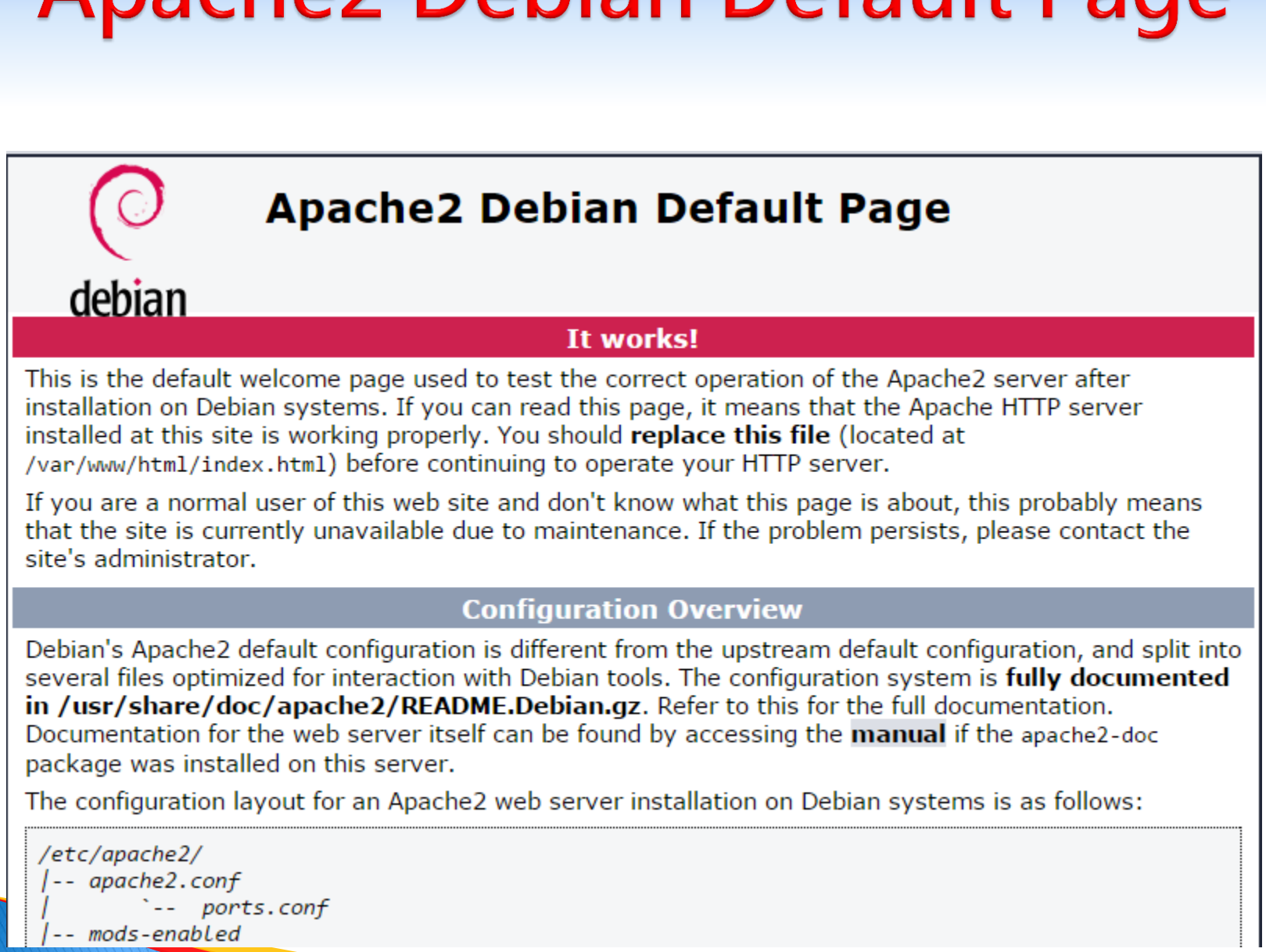
$ sudo service apache2 restart

6. Check if apache2 server is working

Open a web browser and try to connect to apache2 default page

http://192.168.xxx.xxx/html (ip of raspberry Pi)

Apache2 Debian Default Page



Hello, PHP

1. A simple PHP program

$ sudo vim /var/www/hello.php

```
<h1>Hello NUK</h1>
<?php
        phpinfo();
?>
```

2. Check the hello.php

Open a web browser and connect to

http://192.168.xxx.xxx/hello.php

Hello.php

Hello NUK

PHP Version 5.6.24-0+deb8u1

System	Linux raspberrypi 4.4.13-v7+ #894 SMP Mon Jun 13 13:13:27 BST 2016 armv7l
Build Date	Jul 26 2016 23:12:41
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php5/apache2
Loaded Configuration File	/etc/php5/apache2/php.ini
Scan this dir for additional .ini files	/etc/php5/apache2/conf.d
Additional .ini files parsed	/etc/php5/apache2/conf.d/05-opcache.ini, /etc/php5/apache2/conf.d/10-pdo.ini, /etc/php5/apache2/conf.d/20-gd.ini, /etc/php5/apache2/conf.d/20-json.ini, /etc/php5/apache2/conf.d/20-mcrypt.ini, /etc/php5/apache2/conf.d/20-mysql.ini, /etc/php5/apache2/conf.d/20-mysqli.ini, /etc/php5/apache2/conf.d/20-pdo_mysql.ini, /etc/php5/apache2/conf.d/20-readline.ini
PHP API	20131106
PHP Extension	20131226
Zend Extension	220131226
Zend Extension Build	API220131226,NTS
PHP Extension Build	API20131226,NTS
Debug Build	no
Thread Safety	disabled

MySQL + phpmyadmin

1. Install MySQL

$ sudo apt-get install mysql-server

Give a password for MySQL (twice)

2. Test MySQL

$ mysql –u root –p

Input [exit] to leave test

3. Install phpmyadmin

$ sudo apt-get install phpmyadmin

- Input the same password
- Choose the apache2

  [*] apache2

  [ ] lighttpd

MySQL + phpmyadmin

4. Modify apache2.conf
$ sudo vim /etc/apache2/apache2.conf
Add a line at the end of the file
[Include /etc/phpmyadmin/apache.conf]

5. Restart Apache2 server
$ sudo /etc/init.d/apache2 restart

6. Test phpmyadmin
Open a web browser and connect to
http://192.168.xxx.xxx/phpmyadmin

phpMyAdmin


phpMyAdmin
歡迎使用 phpMyAdmin
語系 - Language
中文 - Chinese traditional
登入
使用者名稱:
密碼:
執行

HC-SR04 Ultrasonic Range Sensor

HC-SR04

HC-SR04 Ultrasonic Range Sensor

HC-SR04

Working Voltage: DC 5 V
Working Current: 15mA
Working Frequency: 40Hz
Max Range: 4m
Min Range: 2cm
MeasuringAngle: 15 degree
Trigger Input Signal: 10uS TTL pulse
Echo Output Signal: Input TTL lever signal and the range in proportion

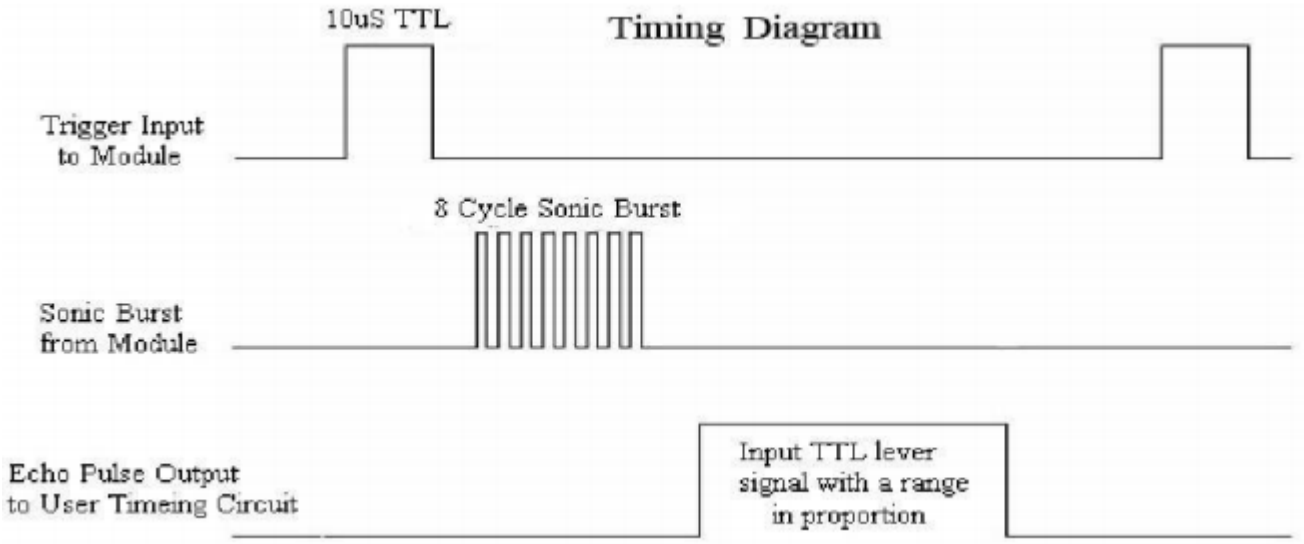
HC-SR04 Ultrasonic Range Sensor

HC-SR04

- Using IO trigger for at least 10us high level signal.
- The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
- IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.
- Test distance = (high level time×velocity of sound (340M/S) / 2.
- When tested objects, the range of area is not less than 0.5 square meters and the plane requests as smooth as possible, otherwise ,it will affect the results of measuring.
- Suggest to use over 60ms measurement cycle, in order to prevent trigger signal to the echo signal.

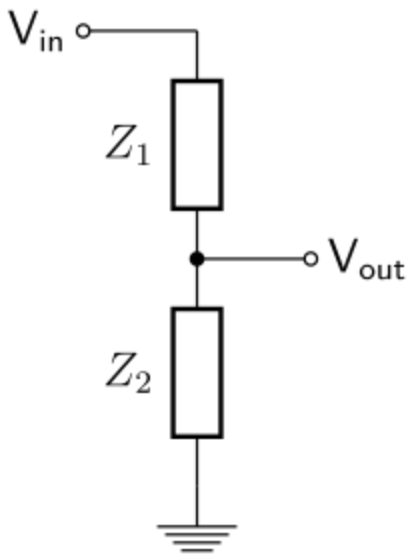
HC-SR04 Ultrasonic Range Sensor

Timing Diagram



Voltage divider

A simple voltage divider



Voltage divider

Equation

$$Vout = Vin \times \frac{R2}{R1 + R2}$$

$$\frac{Vout}{Vin} = \frac{R2}{R1 + R2}$$

$$\frac{3.3}{5} = \frac{R2}{1000 + R2}$$

$$0.66 = \frac{R2}{1000 + R2}$$

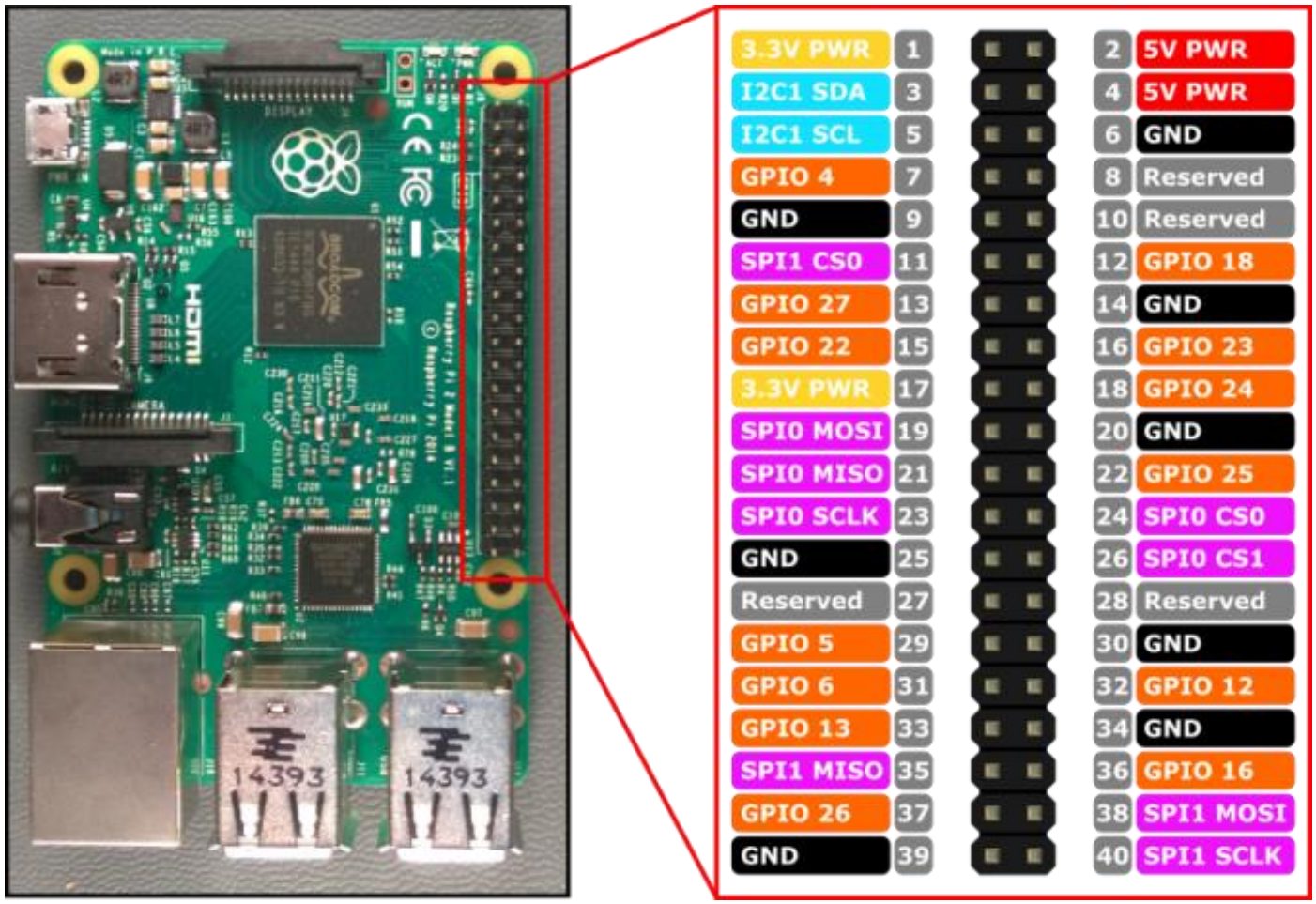
$$0.66(1000 + R2) = R2$$

$$660 + 0.66R2 = R2$$

$$660 = 0.34R2$$

$$1941 = R2$$

Pi3 GPIO Pin


3.3V PWR 1
I2C1 SDA 3
I2C1 SCL 5
GPIO 4 7
GND 9
SPI1 CS0 11
GPIO 27 13
GPIO 22 15
3.3V PWR 17
SPI0 MOSI 19
SPI0 MISO 21
SPI0 SCLK 23
GND 25
Reserved 27
GPIO 5 29
GPIO 6 31
GPIO 13 33
SPI1 MISO 35
GPIO 26 37
GND 39
2 5V PWR
4 5V PWR
6 GND
8 Reserved
10 Reserved
12 GPIO 18
14 GND
16 GPIO 23
18 GPIO 24
20 GND
22 GPIO 25
24 SPI0 CS0
26 SPI0 CS1
28 Reserved
30 GND
32 GPIO 12
34 GND
36 GPIO 16
38 SPI1 MOSI
40 SPI1 SCLK

Pi3 GPIO Pin

Assemble the Circuit:

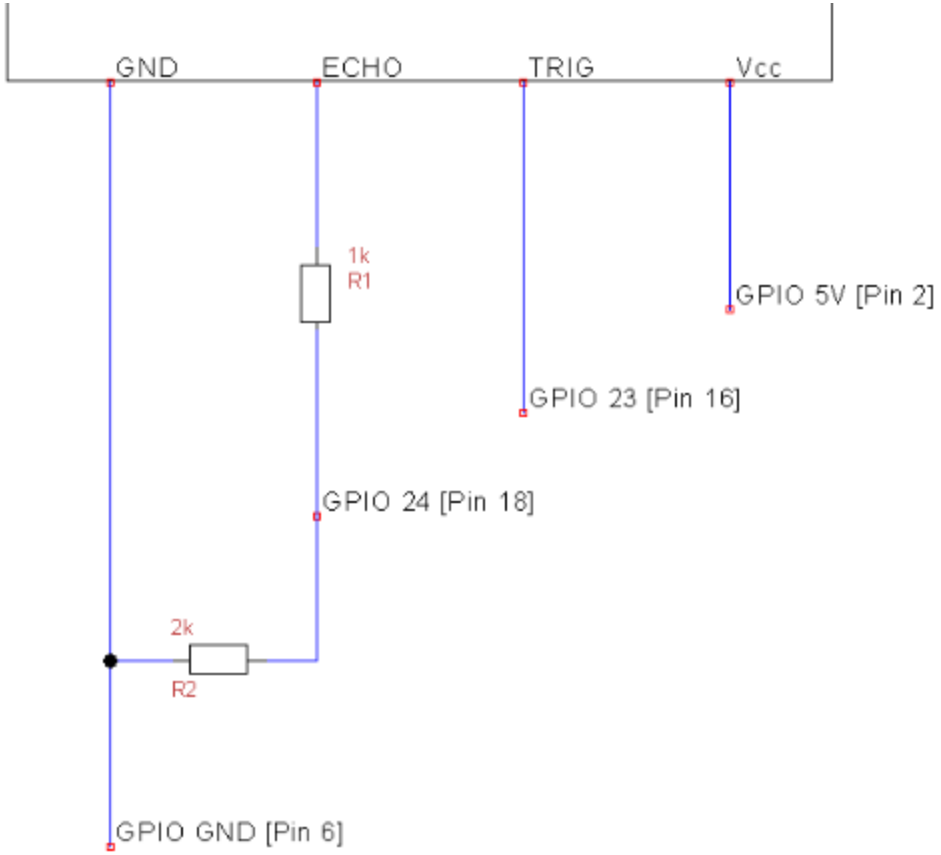
GPIO 5V [Pin 2]; Vcc (5V Power)

GPIO GND [Pin 6]; GND (0V Ground)

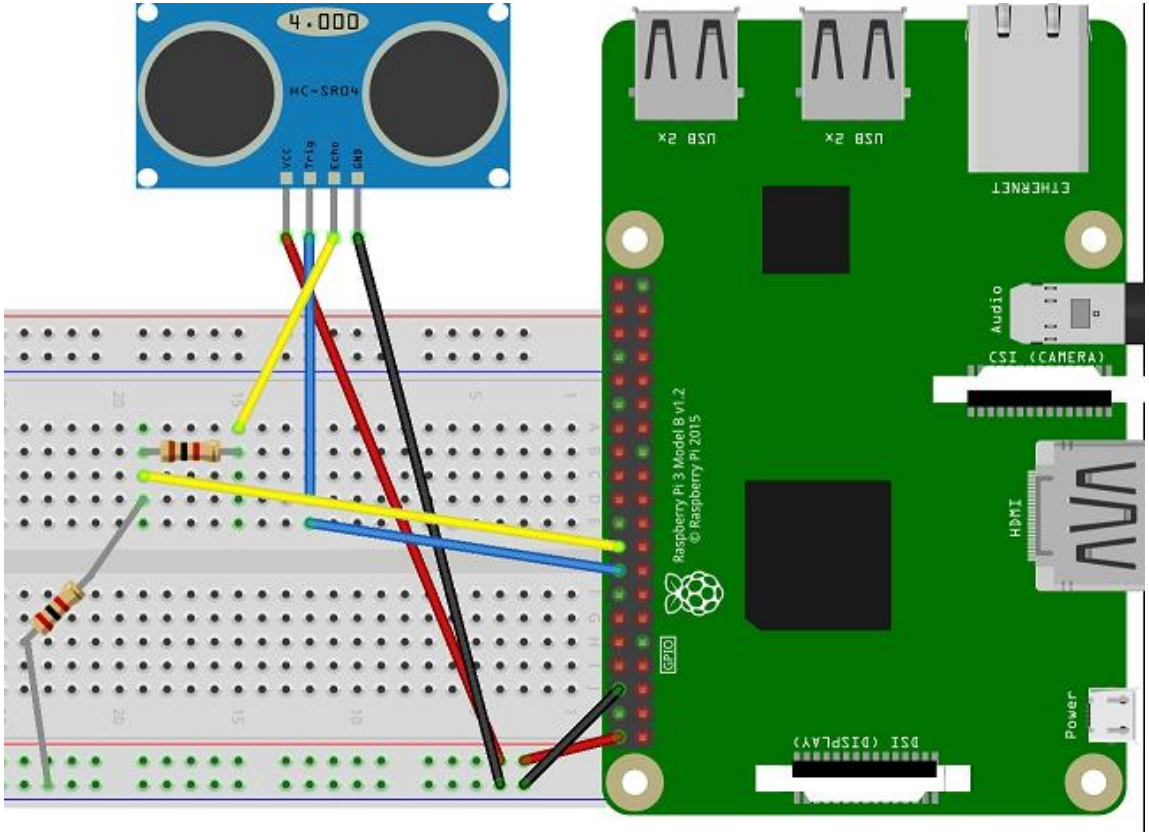
GPIO 23 [Pin 16]; TRIG (GPIO Output)

GPIO 24 [Pin 18]; ECHO (GPIO Input)

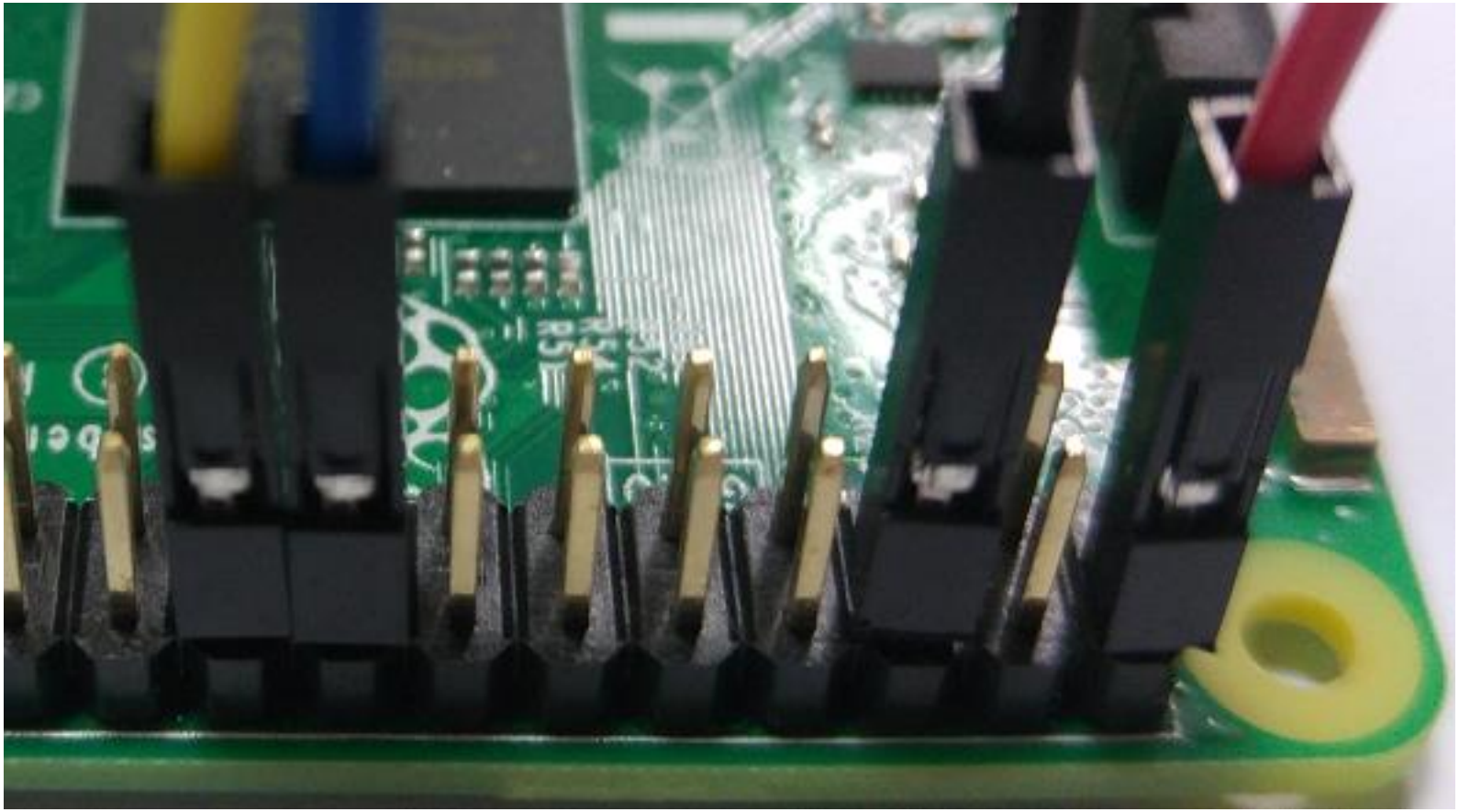
HC-SR04 to Pi3



Fritzing

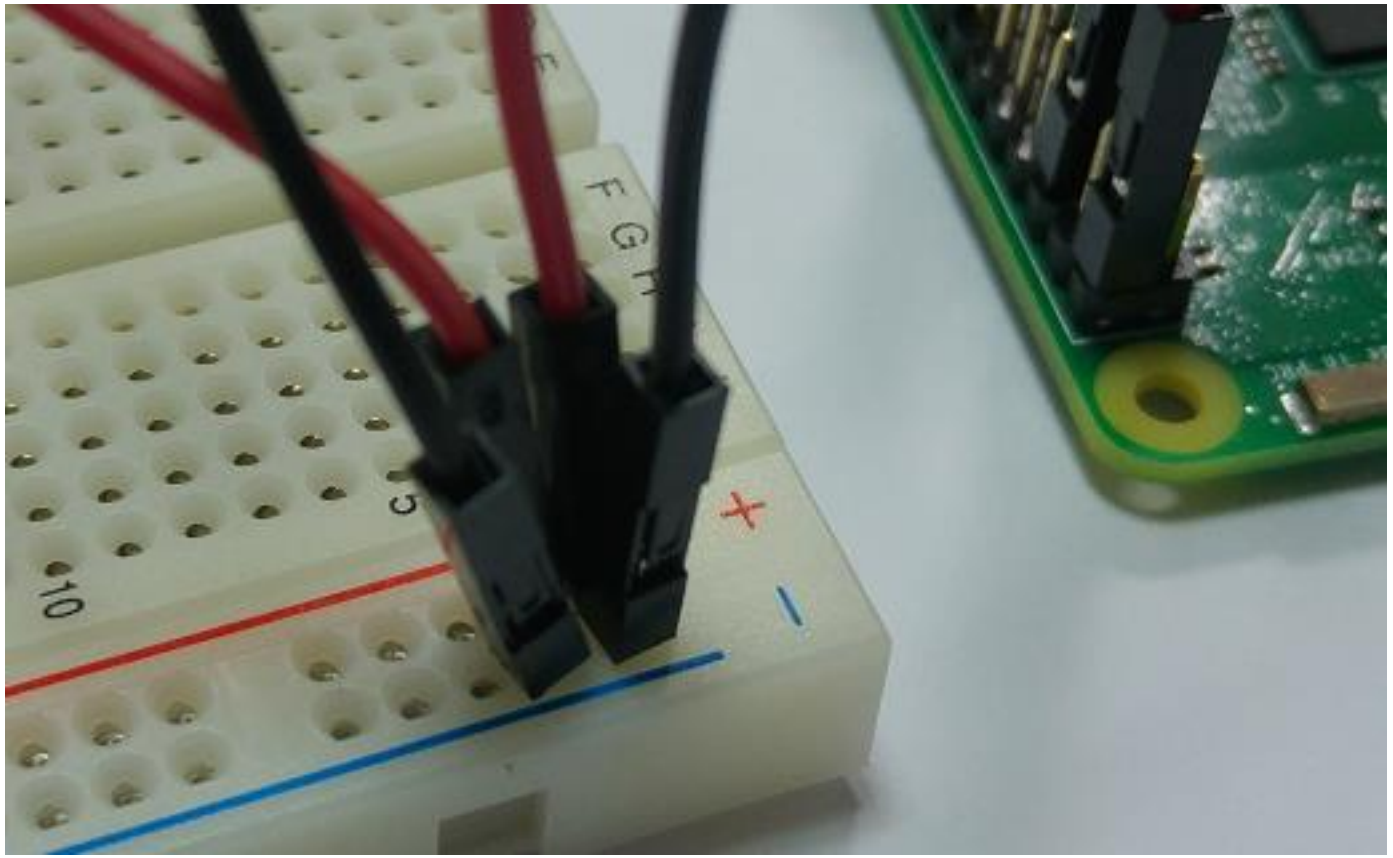

4.000
HC-SR04
Vcc
Trig
Echo
Gnd
USB 2x
USB 2x
ETHERNET
Audio
CSI (CAMERA)
HDMI
Raspberry Pi 3 Model B v1.2
© Raspberry Pi 2015
GPIO
DSI (DISPLAY)
Power

Connection

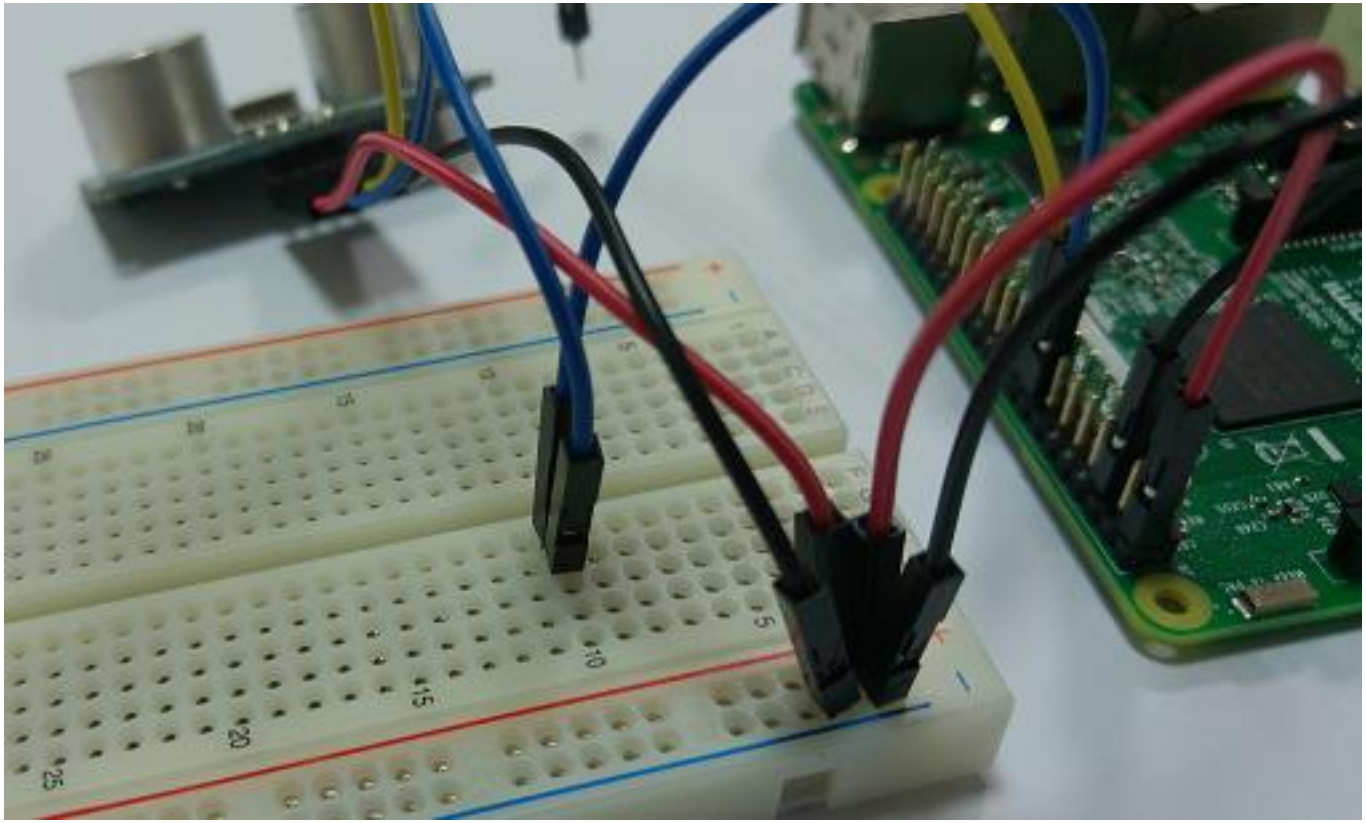


Connection

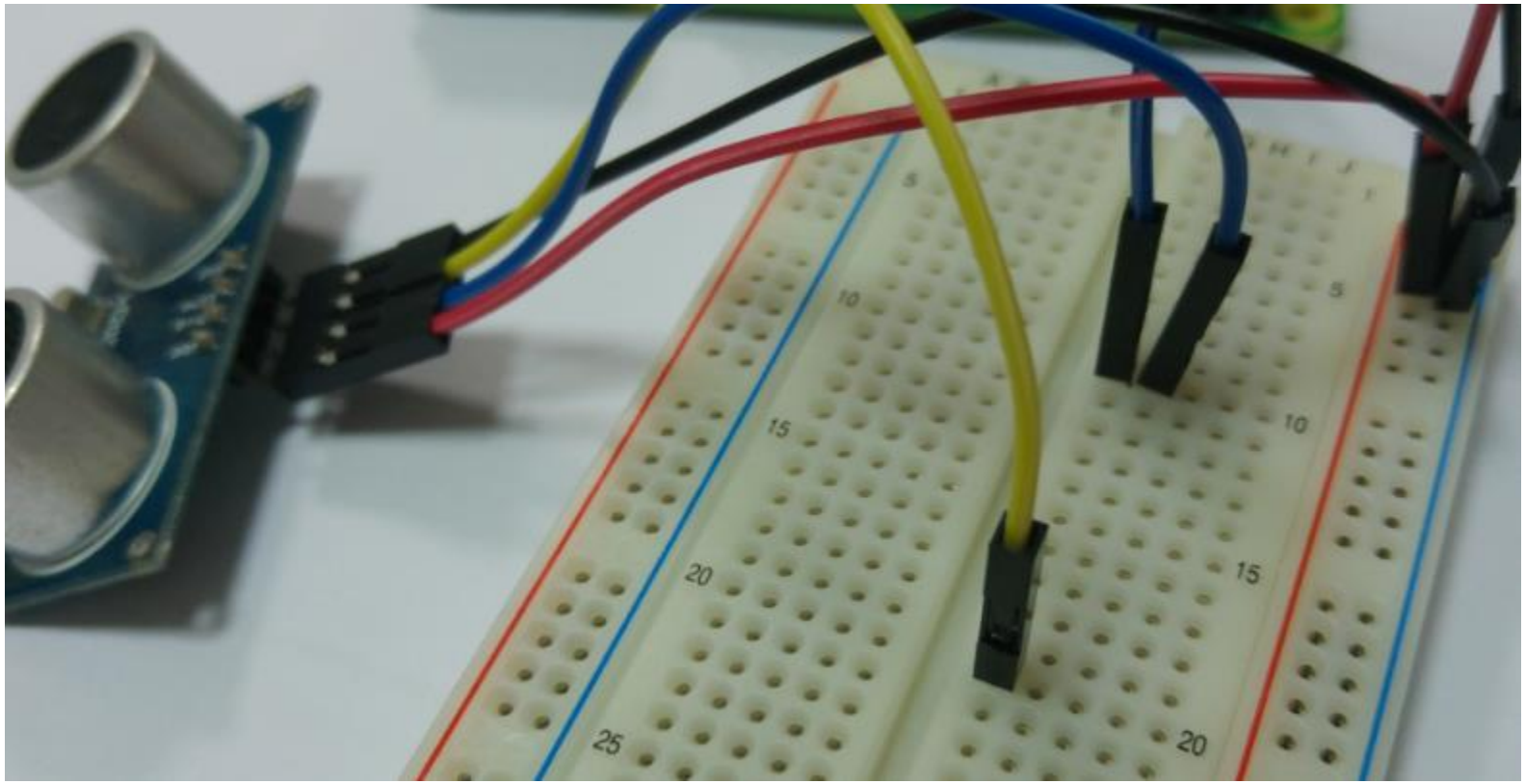
Connection



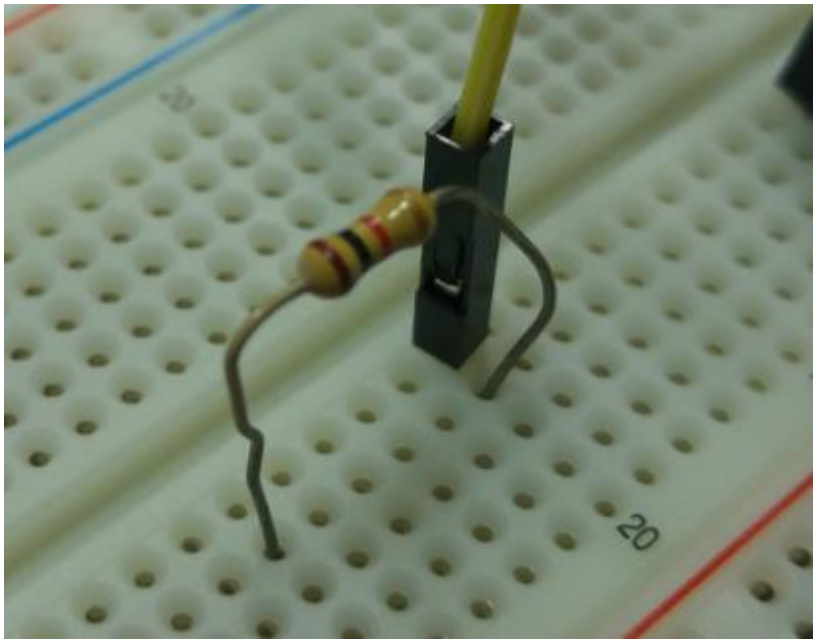
Connection



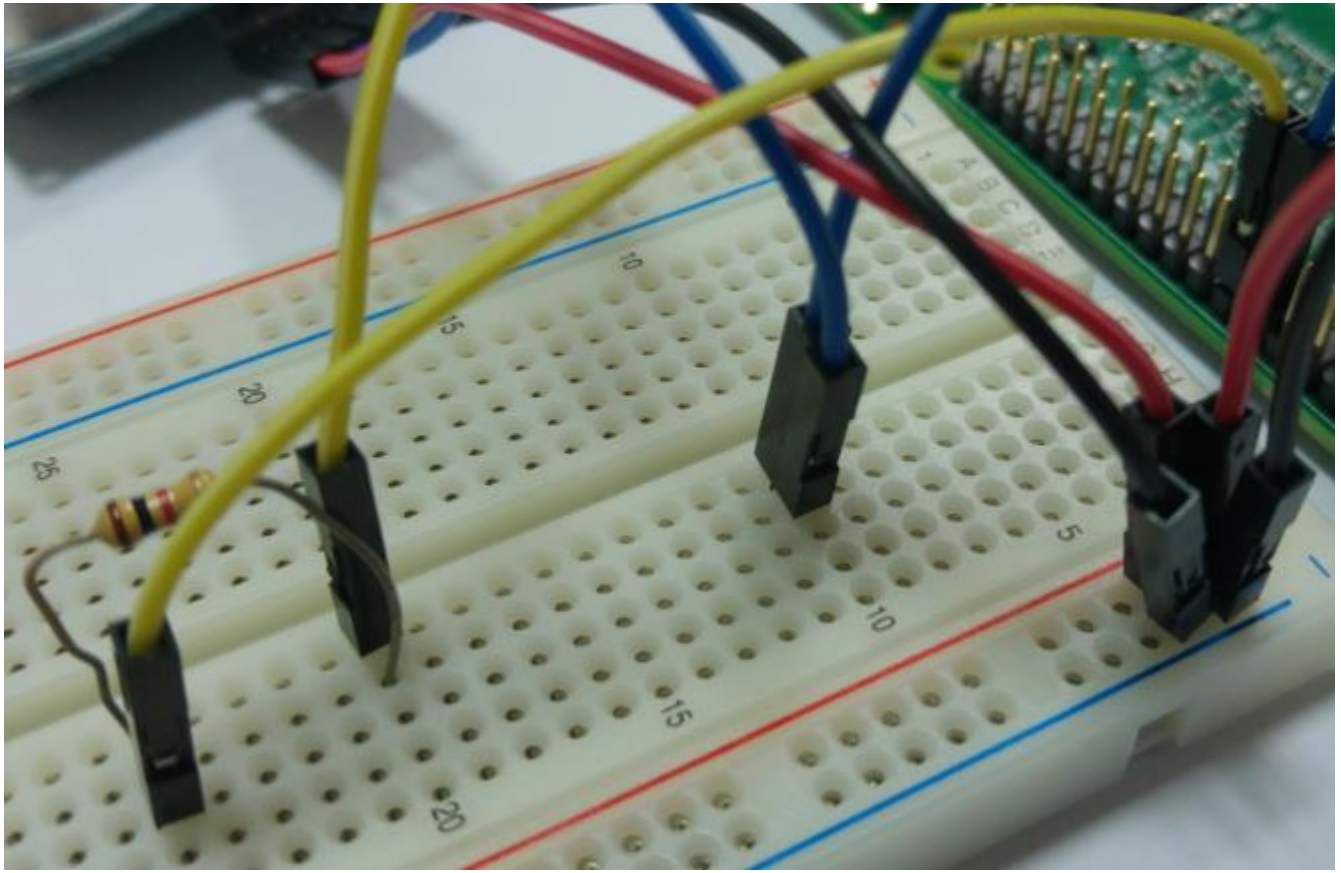
Connection



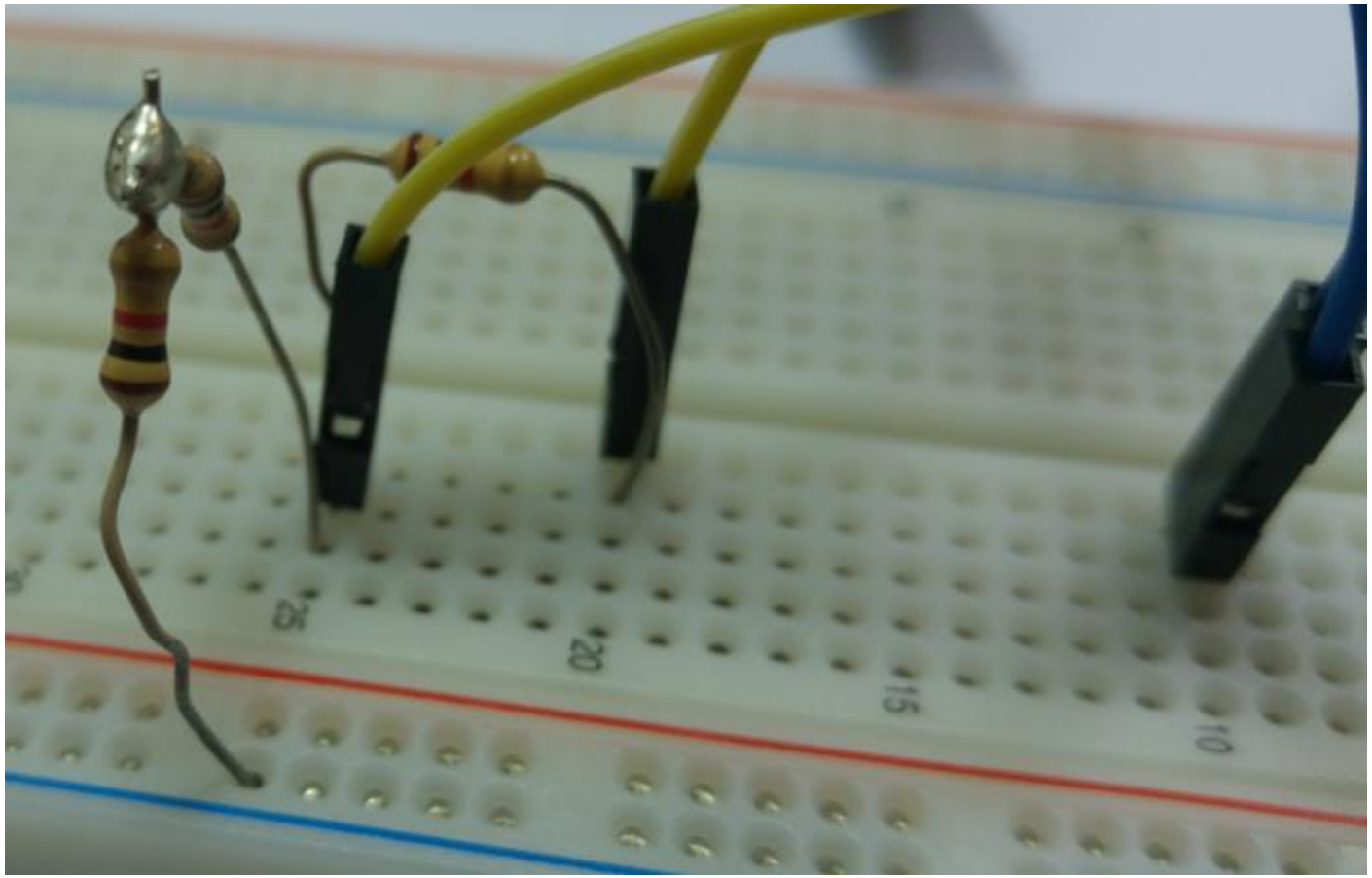
Connection



Connection



Connection



Speed formula

$$Speed = \frac{Distance}{Time}$$

$$34300 = \frac{Distance}{Time/2}$$

$$17150 = \frac{Distance}{Time}$$

$$17150 \times Time = Distance$$

Python Scropt for HC-SR04

1. Add a python script which is named : hc-sr04.py
$ sudo vim hc-sr04.py

2. Run the python program
$ sudo python hc-sr04.py

```
pi@raspberrypi:~ $ sudo python hc-sr04.py
Distance Measurement In Progress
Waiting For Sensor To Settle
Distance: 27.56 cm
pi@raspberrypi:~ $ sudo python hc-sr04.py
Distance Measurement In Progress
Waiting For Sensor To Settle
Distance: 230.0 cm
```

Python Script

```
import RPi.GPIO as GPIO
import time
GPIO.setmode(GPIO.BCM)

TRIG = 23
ECHO = 24

print "Distance Measurement In Progress"

GPIO.setup(TRIG,GPIO.OUT)
GPIO.setup(ECHO,GPIO.IN)

GPIO.output(TRIG, False)
print "Waiting For Sensor To Settle"
time.sleep(2)
```

Python Script

```
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 * 17150

distance = round(distance, 2)

print "Distance:",distance,"cm"
```

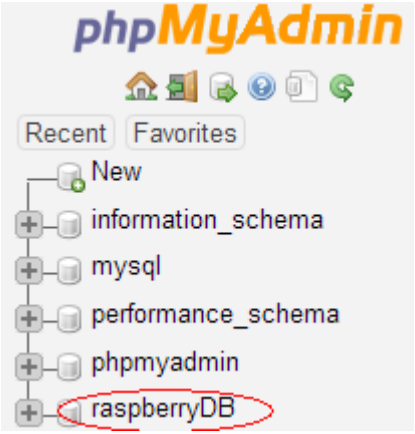
New a Database

1. Click [Databases]

2. Create a new databases named : raspberryDB

3. Select [utf8-unicode_ci] for the collation

4. Press [Create]



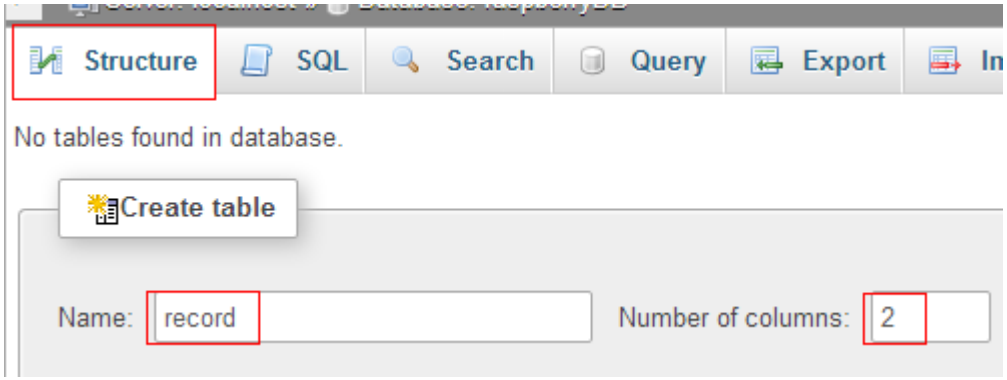
New a table

1. Click [raspberryDB]

2. Create a new table named : record

3. Select [2] for the Number of columns

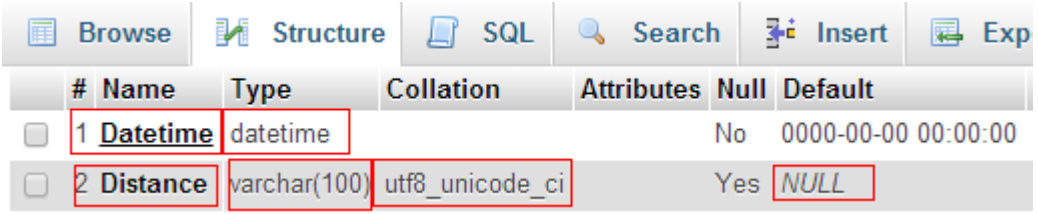
4. Press [Go]



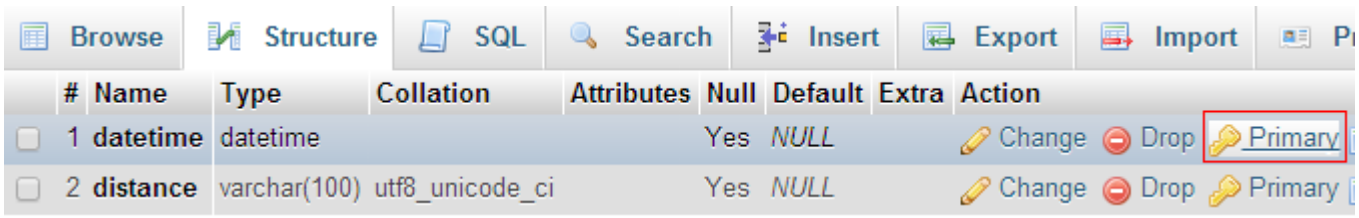
Add two Columns

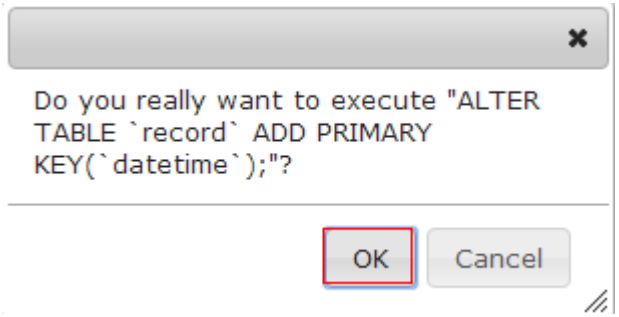
1. Column 1 : [Datatime] [DATETIME] [NULL] [utf8_unicode_ci]

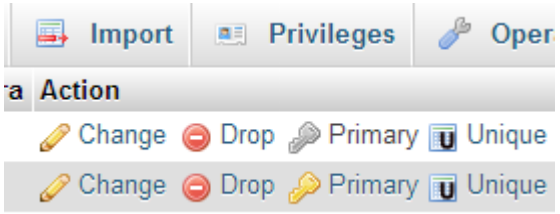
2. Column 2 : [Distance] [VARCHAR] [100] [NULL] [utf8_unicode_ci]



Add Primary Key







Python + MySQL

1. Install python-mysqldb

```
$ sudo apt-get install python-mysqldb
```

2. Modify hc-sr04.py

```
$ sudo vim hc-sr04.py
```

3. Modify :

```
import  time, datetime, MySQLdb
```

4. Add :

```
db = MySQLdb.connect("localhost","root","pi","raspberryDB")
cursor = db.cursor()
```

Python + MySQL

5. Add :

```
try:
   cursor.execute("""INSERT INTO record VALUES (%s,%s)""",(dateti
me.datetime.now().strftime("%Y-%m-%d %H:%M:%S"),distance))
   db.commit()
   print "Data committed  “

except:
   db.rollback()

db.close()
```

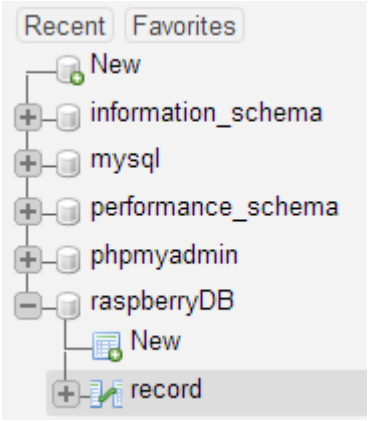
Python + MySQL

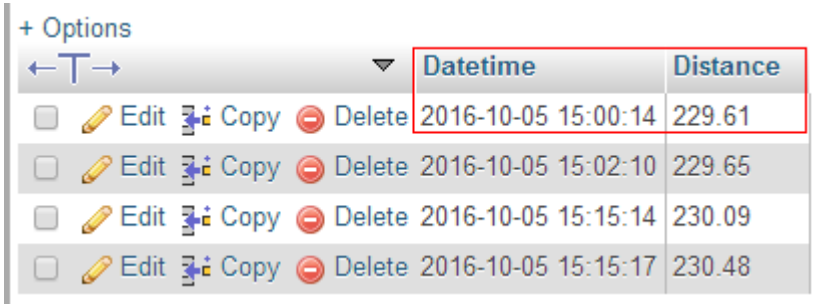
Run the new python program
$ sudo python hc-sr04.py

```
pi@raspberrypi:~ $ sudo python hc-sr04.py
Distance Measurement In Progress
Waiting For Sensor To Settle
Distance: 230.09 cm
Data committed
pi@raspberrypi:~ $ sudo python hc-sr04.py
Distance Measurement In Progress
Waiting For Sensor To Settle
Distance: 230.48 cm
Data committed
```

phpMyAdmin

Check record table





PHP table

Add a php program named : showTable.php (under /vaw/www)

```
$ sudo vim showTable.php
<?php
$con=mysqli_connect("localhost", "root", "pi", "raspberryDB");
if (mysqli_connect_errno()) {
   echo "Fail to connect to MySQL server: " . mysqli_connect_error();
}

$result = mysqli_query($con,"SELECT * FROM record");

echo "<table border='1'>
<tr>
<th>Date Time</th>
<th>Distance</th>
</tr>";
```

PHP table

```
while($row = mysqli_fetch_array($result))
{
   echo "<tr>";
   echo "<td>" . $row['Datetime'] . "</td>";
   echo "<td>" . $row['Distance'] . "</td>";
   echo "</tr>";
   $Lables=$Lables. '"' . $row[Datetime]. '",';
   $dis=$dis. '"' . $row[Distance]. '",';
}


echo "</table>";
mysqli_close($con);
?>
```

PHP Table

Open a web browser and connect to
http://192.168.xxx.xxx/showTable.php

Date Time	Distance
2016-10-05 15:00:14	229.61
2016-10-05 15:02:10	229.65
2016-10-05 15:15:14	230.09
2016-10-05 15:15:17	230.48
2016-10-06 15:49:28	327.77
2016-10-06 15:49:41	13.26

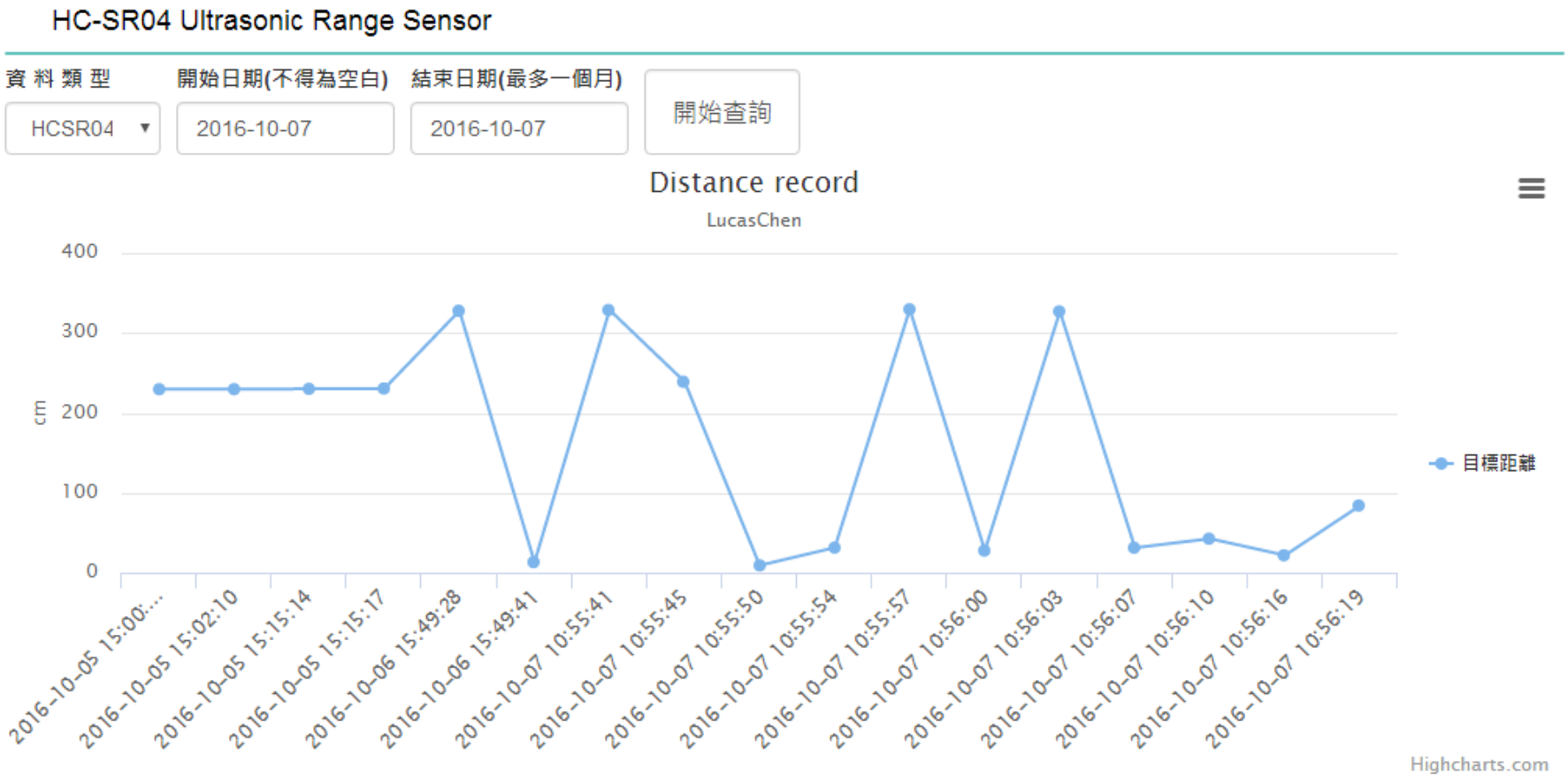
Future work

1. Automatic execution? (shell script + crontab)

2. Chart? (jquery ; highchart.js ; Chart.js)

3. Remote control? (CGI ; Android app ; ConnectBot)

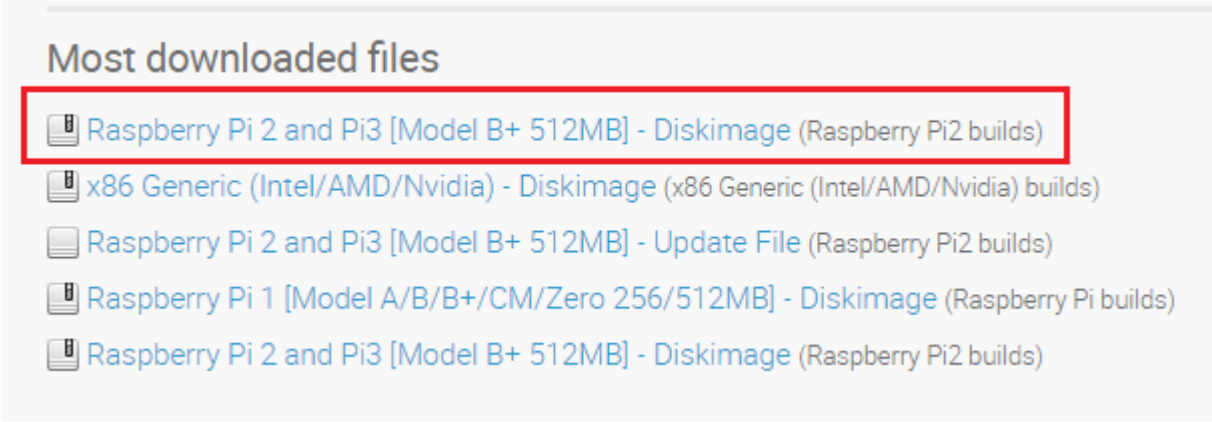
highcharts

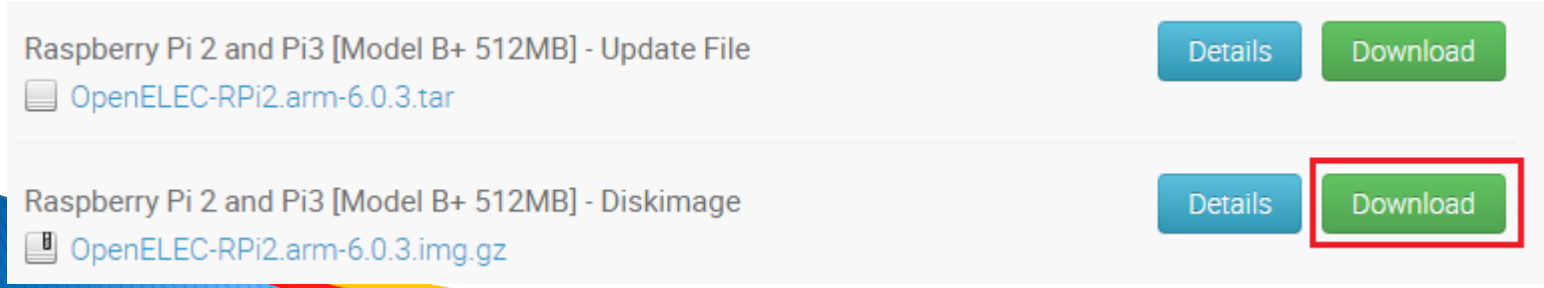

HC-SR04 Ultrasonic Range Sensor
資 料 類 型
HCSR04
開始日期(不得為空白)
2016-10-07
結束日期(最多一個月)
2016-10-07
開始查詢
Distance record
LucasChen
400
300
200
100
0
cm
2016-10-05 15:00:...
2016-10-05 15:02:10
2016-10-05 15:15:14
2016-10-05 15:15:17
2016-10-06 15:49:28
2016-10-06 15:49:41
2016-10-07 10:55:41
2016-10-07 10:55:45
2016-10-07 10:55:50
2016-10-07 10:55:54
2016-10-07 10:55:57
2016-10-07 10:56:00
2016-10-07 10:56:03
2016-10-07 10:56:07
2016-10-07 10:56:10
2016-10-07 10:56:16
2016-10-07 10:56:19
目標距離
Highcharts.com

OpenELEC

OpenELEC : Open Embedded Linux Entertainment Center

1. Download DiskImage for Pi3
http://openelec.tv/get-openelec





Static IP

#sudo vim /etc/dhcpcd.conf

```
interface eth0
static ip_address=192.168.0.10/24
static routers=192.168.0.1
static domain_name_servers=192.168.0.1

interface wlan0
static ip_address=192.168.0.200/24
static routers=192.168.0.1
static domain_name_servers=192.168.0.1
```

Q&A

Thanks for reading

Reference

https://www.modmypi.com/blog/hc-sr04-ultrasonic-range-sensor-on-the-raspberry-pi

http://elecfreaks.com/store/download/HC-SR04.pdf

https://en.wikipedia.org/wiki/Voltage_divider