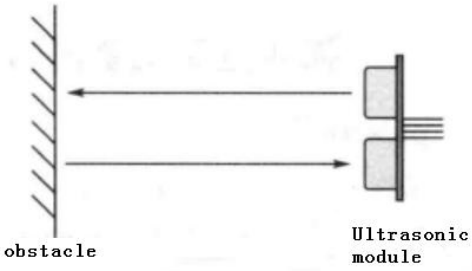
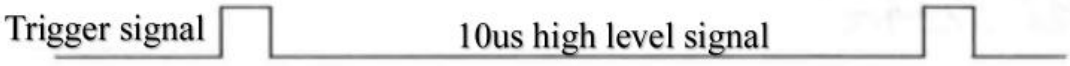
Chapter6: Ultrasonic ranging

The ultrasonic module is a sensor that uses ultrasonic characteristics to detect the distance. It has two ultrasonic probes for transmitting and receiving ultrasonic waves. The range of measurement is 3-450 cm



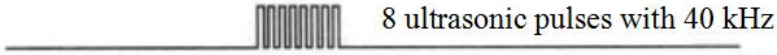
3-1 Ultrasonic emission and reception schematic

(1) You need to input a high level signal of at least 10us to the Trig pin to trigger the ranging function of the ultrasonic module.

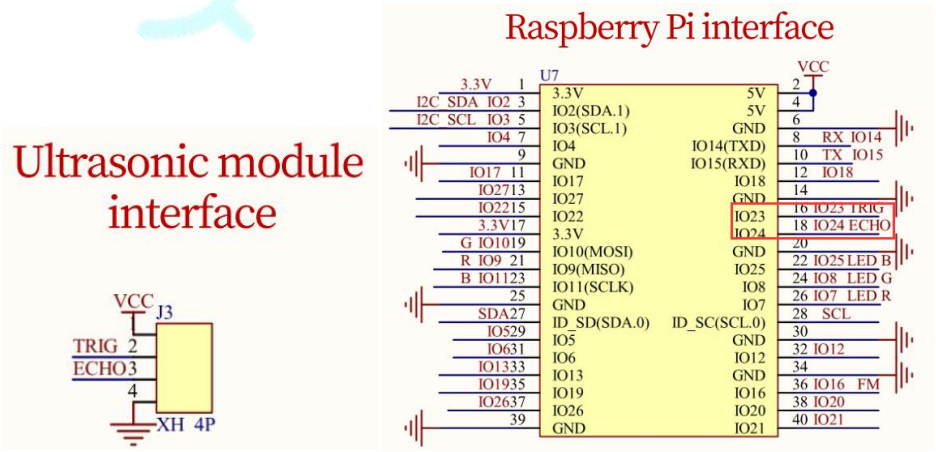


3-2 Ultrasonic module sends trigger signal

(2) After the ranging function is triggered, the module will automatically send out 8 ultrasonic pulses with 40 kHz and automatically detect whether there is a signal return. This step is done internally by the module.



(3) When the module detects an echo signal, the ECHO pin will output a high level. The high level duration is the time from when the ultrasonic wave is sent to when it returns. You can calculate the distance by using the time function to calculate the high level duration. Formula: Distance = High level duration * Speed of sound(340M/S)/2.



According to the schematic diagram. Trig pin connected to the GPIO20 and Echo pin connected to the GPIO21 of the Raspberry Pi.

The program is shown below：

```
#!/usr/bin/env python2
# -*- coding: utf-8 -*-
"""
Created on Wed Jan  9 12:08:58 2019

@author: pi
"""
import RPi.GPIO as GPIO
import time
trig= 23
echo=24

GPIO.setmode(GPIO.BCM)
GPIO.setup(trig,GPIO.OUT,initial=GPIO.LOW)
GPIO.setup(echo,GPIO.IN)

time.sleep(2)

def distance():
    GPIO.output(trig,GPIO.HIGH)
    time.sleep(0.00015)
    GPIO.output(trig,GPIO.LOW)
    while not GPIO.input(echo):
        pass
    t1=time.time()
    while GPIO.input(echo):
        pass
    t2=time.time()
    print((t2-t1)*340*100/2)


try:
    while True:
        distance()
        time.sleep(1)
except KeyboardInterrupt:
    GPIO.cleanup()
```

The result of the program is: the distance between the ultrasonic sensor and the obstacle in front is output every 1 second.

!!!Note: The effective measuring distance of the ultrasonic distance measuring sensor is 0.03m to 4.5 meters, if the distance of the target obstacle is not within this range. It will not get the correct distance value.