

Assignment -4

Name:B.E.Dharani

Regno:950819106013

```
#include <stdio.h>
#include <stdbool.h>
#include <freertos/FreeRTOS.h>
#include <freertos/task.h>
#include <esp_err.h>
#include "ultrasonic.h"
#define ECHO_GPIO 12
#define TRIGGER_GPIO 13
#define MAX_DISTANCE_CM 500 // Maximum of 5 meters
void ultrasonic_test(void *pvParameters)
{
    float distance;
    ultrasonic_sensor_t sensor = {
        .trigger_pin = TRIGGER_GPIO,
        .echo_pin = ECHO_GPIO
    };
    ultrasonic_init(&sensor);
    while (true) {
        esp_err_t res = ultrasonic_measure(&sensor, MAX_DISTANCE_CM, &distance);
        if (res == ESP_OK) {
            printf("Distance: %0.04f m\n", distance);
        } // Print error
        else {
            printf("Error %d: ", res);
            switch (res) {
                case ESP_ERR_ULTRASONIC_PING:
                    printf("Cannot ping (device is in invalid state)\n");
                    break;
                case ESP_ERR_ULTRASONIC_PING_TIMEOUT:
                    printf("Ping timeout (no device found)\n");
                    break;
                case ESP_ERR_ULTRASONIC_ECHO_TIMEOUT:
                    printf("Echo timeout (i.e. distance too big)\n");
                    break;
                default:
                    printf("%s\n", esp_err_to_name(res));
            }
        }
    }
}
```

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```
}  
vTaskDelay(pdMS_TO_TICKS(500));  
}  
}  
void app_main()  
{  
xTaskCreate(ultrasonic_test, "ultrasonic_test", configMINIMAL_STACK_SIZE * 3,  
NULL, 5, NULL);  
}
```

Wokwi IDE interface showing the Ultrasonic_sensor.ino code and a simulation of the circuit.

Code (Ultrasonic_sensor.ino):

```
8  
9 #define ECHO_PIN 2  
10 #define TRIG_PIN 3  
11  
12 void setup() {  
13   Serial.begin(115200);  
14   pinMode(LED_BUILTIN, OUTPUT);  
15   pinMode(TRIG_PIN, OUTPUT);  
16   pinMode(ECHO_PIN, INPUT);  
17 }  
18  
19 float readDistanceCM() {  
20   digitalWrite(TRIG_PIN, LOW);  
21   delayMicroseconds(2);  
22   digitalWrite(TRIG_PIN, HIGH);  
23   delayMicroseconds(10);  
24   digitalWrite(TRIG_PIN, LOW);  
25   int duration = pulseIn(ECHO_PIN, HIGH);  
26   return duration * 0.034 / 2;  
27 }  
28  
29 void loop() {  
30   float distance = readDistanceCM();  
31  
32   bool isNearby = distance < 100;  
33   digitalWrite(LED_BUILTIN, isNearby);  
34  
35   Serial.print("Measured distance: ");  
36   Serial.println(readDistanceCM());  
37  
38   delay(100);  
39 }  
40
```

Simulation:

The simulation shows an Arduino Uno connected to an HC-SR04 ultrasonic sensor. The sensor's VCC pin is connected to the 5V pin on the Arduino, and its GND pin is connected to the GND pin. The TRIG pin is connected to digital pin 3, and the ECHO pin is connected to digital pin 2. A red LED is connected to the Arduino's 5V pin and GND pin.

Measured distance: 96.68
Measured distance: 96.68
Measured distance: 96.76
Measured distance: 96.76
Measured distance: 96.66
Measured distance: 96.68
Measured distance: 96.68