LAB 10

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Conteúdo

1 Exercício 1

```
/*

  1.MEdir o tempo (millis) -> de 25 em ms envia um pulso ao Trigger
  2. Enviar o pulso ao trigger (digitalWrite(pinTrigger, HIGH))
  3. Se o estado do trigger for LOW então:
   3.1 Obter o tempo coma função pulse in
   3.2 Calcular a distância
   3.3 Imprimira distânica
  4. FIMSE
  5.Alterar o estadoTrigger para o valor inverso

  */
  //interrupt 0 -> pin 2 (d)
  //interrupt 1 -> pin 3 (d)

  //Modos:
  //change ( 0 -> 1 ; 1 -> 0)
  //rising (0 -> 1)
  //falling (1 -> 0)

  // Vsom = 0.0343 cm/microsegundo
  // d= v * deltaT / 2
  // d= 0.0343 * T / 2 = 0.01715T
  // DataSheet: t/ 58.31
  //Trigger - pino digital qualquer (em nivel HIGH), pulso 10ms
  //Echo- pino digital 2 ou 3, HIGH,
  // Detetar a mudnaça com  interrupt 0 no Change


#define pinTrigger 5
#define pinEcho 2

unsigned long current_time = 0;
unsigned long previous_time = 0;
```

```
int delay_trigger = 25;
double distance = 0;
bool triggerStatus = LOW;
unsigned long duration  = 0; // Para guardar o resultado do pulseIn()


void setup() {
 pinMode(pinEcho, INPUT);
 pinMode(pinTrigger, OUTPUT);
 Serial.begin(9600);
 Serial.print("Distance (cm) : ");
}

void loop() {

  current_time = millis();


   //1. MEdir o tempo (millis) -> de 25 em ms envia um pulso ao Trigge
   if (current_time - previous_time >= delay_trigger) {
     previous_time = current_time;



      //2. Enviar o pulso ao trigger
      digitalWrite(pinTrigger, triggerStatus);

      //3. Se o estado do trigger for LOW então:
      if( triggerStatus == LOW) {
        //3.1 Obter o tempo coma função pulse in
        duration = pulseIn(pinEcho, HIGH); //micros



          //3.2 Calcular a distância
          distance = duration / 58.31;
          //3.3 Imprimira distânica
          Serial.print("Distance (cm) : ");
```

```
            Serial.println (distance);

        //4. FIMSE
        }
        //5. Alterar o estadoTrigger para o valor inverso
        triggerStatus = !triggerStatus;

    }

}
```

2 Exercicio 2

```
#include <TimerOne.h>

#define pinTrigger 5
#define pinEcho 2

//unsigned long current_time = 0;
//unsigned long previous_time = 0;
//int delay_trigger = 25;
double distance = 0;
bool newRead = false;
volatile long duration  = 0; // Para guardar o resultado do pulseIn()
bool TriggerStatus = LOW;
unsigned long initial_time;
unsigned long final_time;



void setup() {
 pinMode(pinEcho, INPUT);
 pinMode(pinTrigger, OUTPUT);
 Serial.begin(9600);


 //Timer Interrupts
 Timer1.initialize(25000); //delay_tigger 25ms
 Timer1.attachInterrupt (triggerSignal);
 //Hardware interrupt
 attachInterrupt(0, echoTime, CHANGE);


}

void triggerSignal(){
  digitalWrite(pinTrigger, TriggerStatus);
```

```
  TriggerStatus = ! TriggerStatus;
}

void echoTime() {
     if (digitalRead(pinEcho) == HIGH) {
       //começar contagem
       initial_time = micros();
     } else {
       final_time = micros();
       duration = final_time - initial_time;
       newRead = true;
     }
}


void loop() {
if (newRead) {
  distance = duration / 58.31;
  Serial.print("Distance (cm) : ");
  Serial.println(distance);
  newRead = false;
 }
}
```

3 Exercicio 3

```
/*
 * Ultrasonic Simple
 * Prints the distance read by an ultrasonic sensor in
 * centimeters. They are supported to four pins ultrasound
 * sensors (liek HC-SC04) and three pins (like PING)))
 * and Seeed Studio sensors).
 *
 * The circuit:
 * * Module HR-SC04 (four pins) or PING))) (and other with
 *   three pins), attached to digital pins as follows:
 * --------------------    --------------------
 * | HC-SC04 | Arduino |    | 3 pins | Arduino |
 * --------------------    --------------------
 * |   Vcc   |   5V    |    |   Vcc  |   5V    |
 * |   Trig  |   12    | OR |   SIG  |   13    |
 * |   Echo  |   13    |    |   Gnd  |   GND   |
 * |   Gnd   |   GND   |    --------------------
 * --------------------
 * Note: You do not obligatorily need to use the pins defined above
 *
 * By default, the distance returned by the read()
 * method is in centimeters. To get the distance in inches,
 * pass INC as a parameter.
 * Example: ultrasonic.read(INC)
 *
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 * modified 23 Jan 2017
 * by Erick Simões (github: @ErickSimoes | twitter: @AloErickSimoes)
 * modified 03 Mar 2017
 * by Erick Simões (github: @ErickSimoes | twitter: @AloErickSimoes)
 * modified 11 Jun 2018
 * by Erick Simões (github: @ErickSimoes | twitter: @AloErickSimoes)
 *
 * This example code is released into the MIT License.
```

```
 */

#include <Ultrasonic.h>

/*
 * Pass as a parameter the trigger and echo pin, respectively,
 * or only the signal pin (for sensors 3 pins), like:
 * Ultrasonic ultrasonic(13);
 */
Ultrasonic ultrasonic(5, 2);
int distance;

void setup() {
  Serial.begin(9600);
}

void loop() {
  // Pass INC as a parameter to get the distance in inches
  distance = ultrasonic.read();

  Serial.print("Distance in CM: ");
  Serial.println(distance);
  delay(1000);
}
```