GKL611 Datenerfassung mit Sensoren und Aktoren

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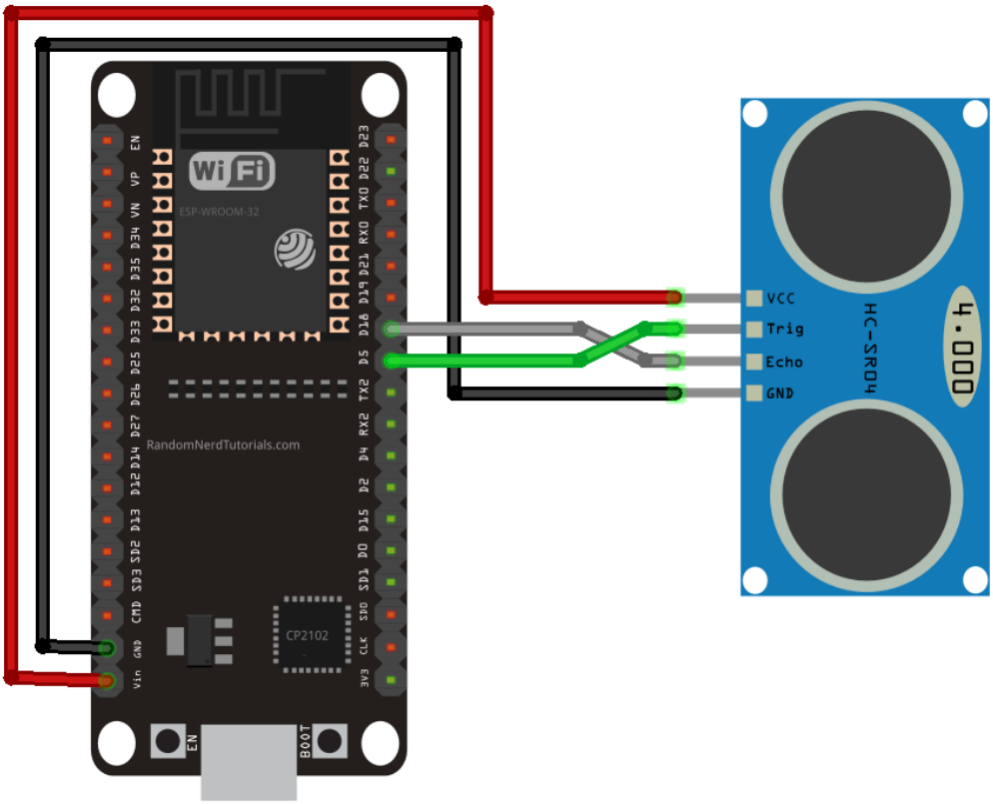
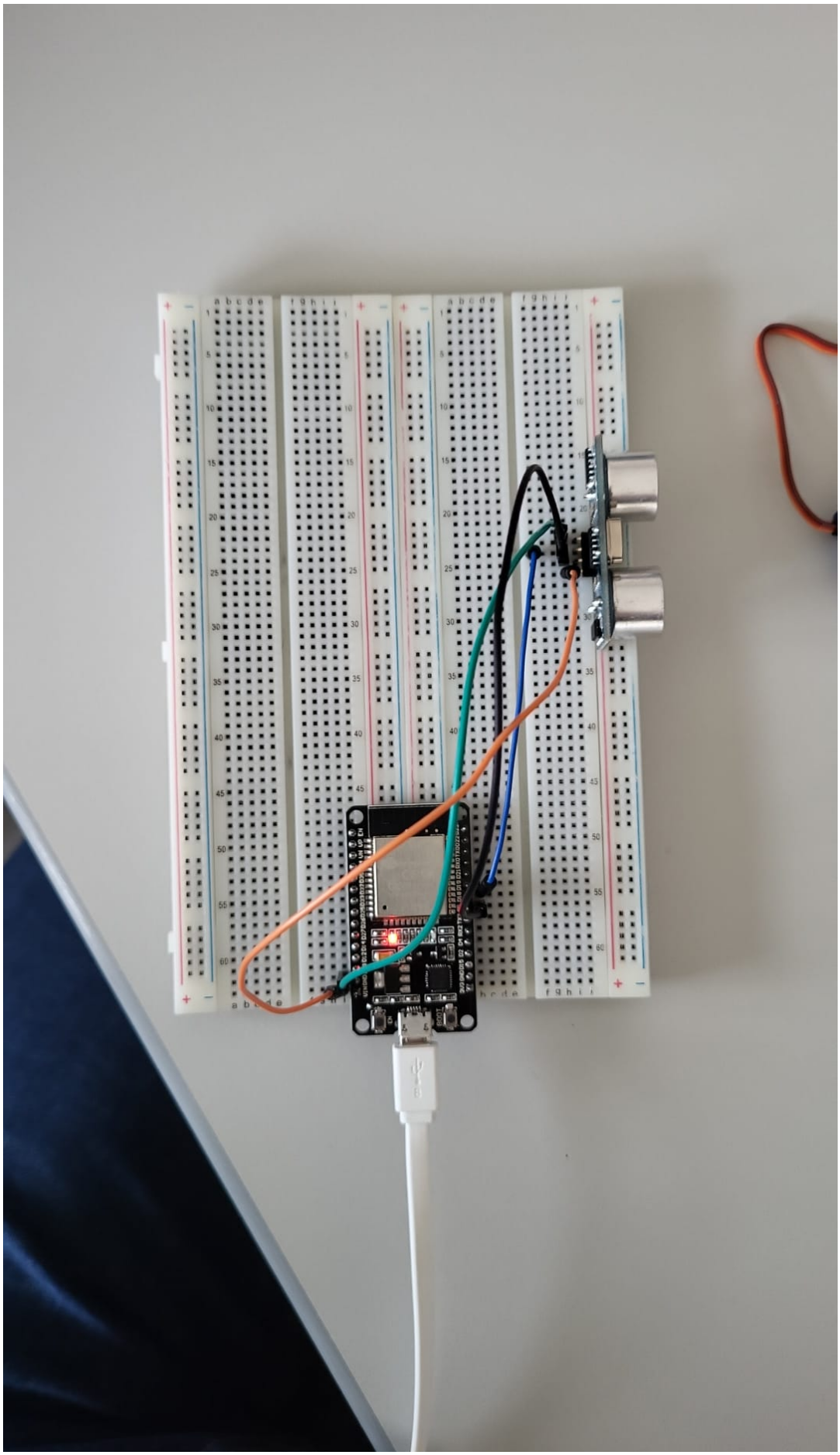
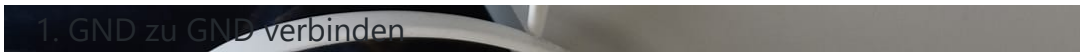
1 Anschießen des Ultrasschallsensor

Webside: ESP32 with HC-SR04 Ultrasonic Sensor with Arduino IDE | Random Nerd Tutorials







2. VCC zu VIN

3. Trig zu D5

4. Echo zu D18 Code zum Testen:

```
/*********
  Rui Santos
  Complete project details at https://RandomNerdTutorials.com/esp32-hc

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  copies or substantial portions of the Software.
*********/

const int trigPin = 5;
const int echoPin = 18;

//define sound speed in cm/uS
#define SOUND_SPEED 0.034
#define CM_TO_INCH 0.393701

long duration;
float distanceCm;
float distanceInch;

void setup() {
  Serial.begin(115200); // Starts the serial communication
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
}

void loop() {
  // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  // Reads the echoPin, returns the sound wave travel time in microsec
```
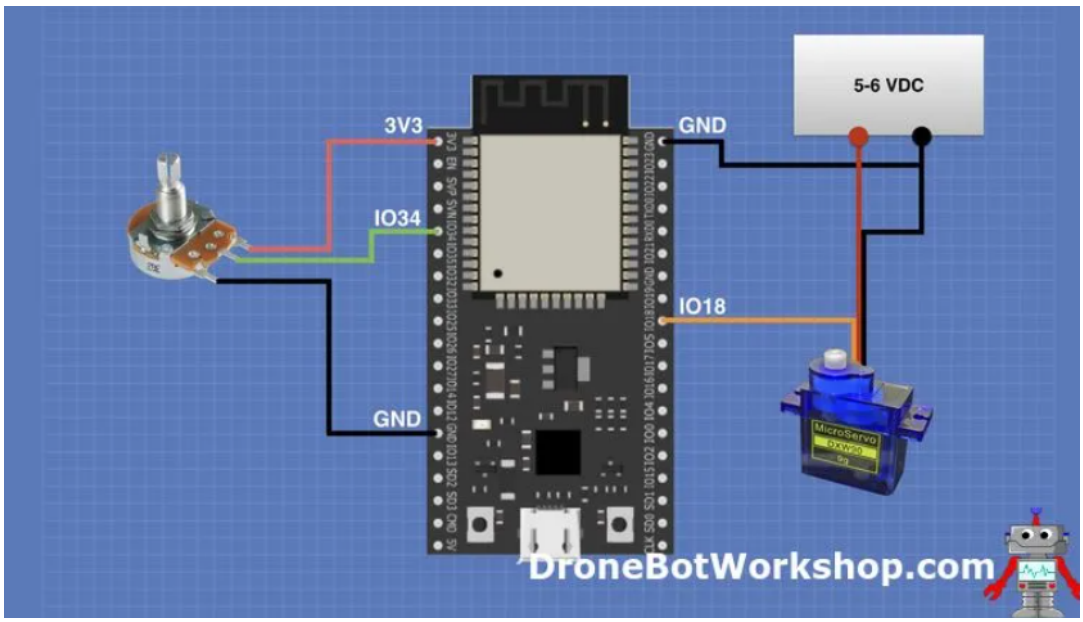
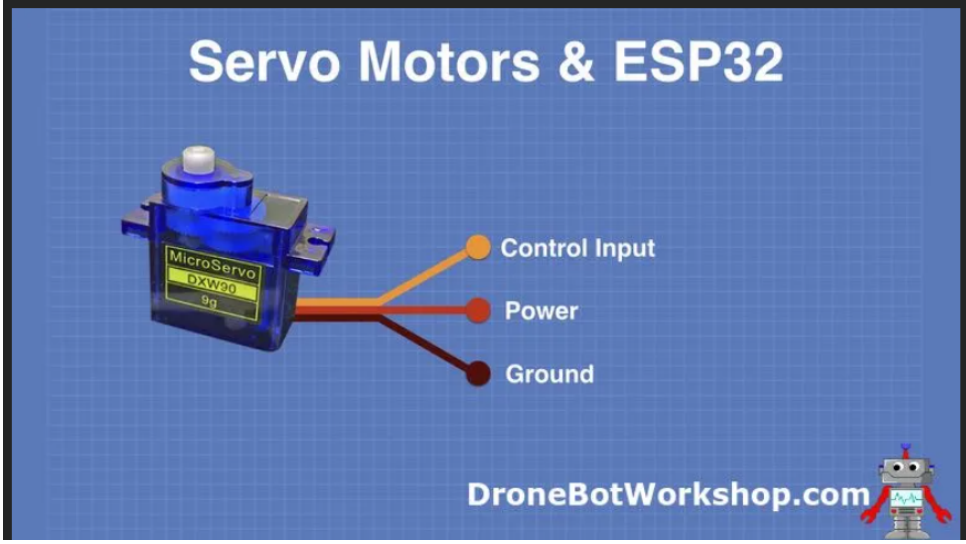

```
  duration = pulseIn(echoPin, HIGH);

  // Calculate the distance
  distanceCm = duration * SOUND_SPEED/2;

  // Convert to inches
  distanceInch = distanceCm * CM_TO_INCH;

  // Prints the distance in the Serial Monitor
  Serial.print("Distance (cm): ");
  Serial.println(distanceCm);
  Serial.print("Distance (inch): ");
  Serial.println(distanceInch);

  delay(1000);
}
```

2: Servomotor

Für den 2 Schritt stecke den Ultraschallsensor aus



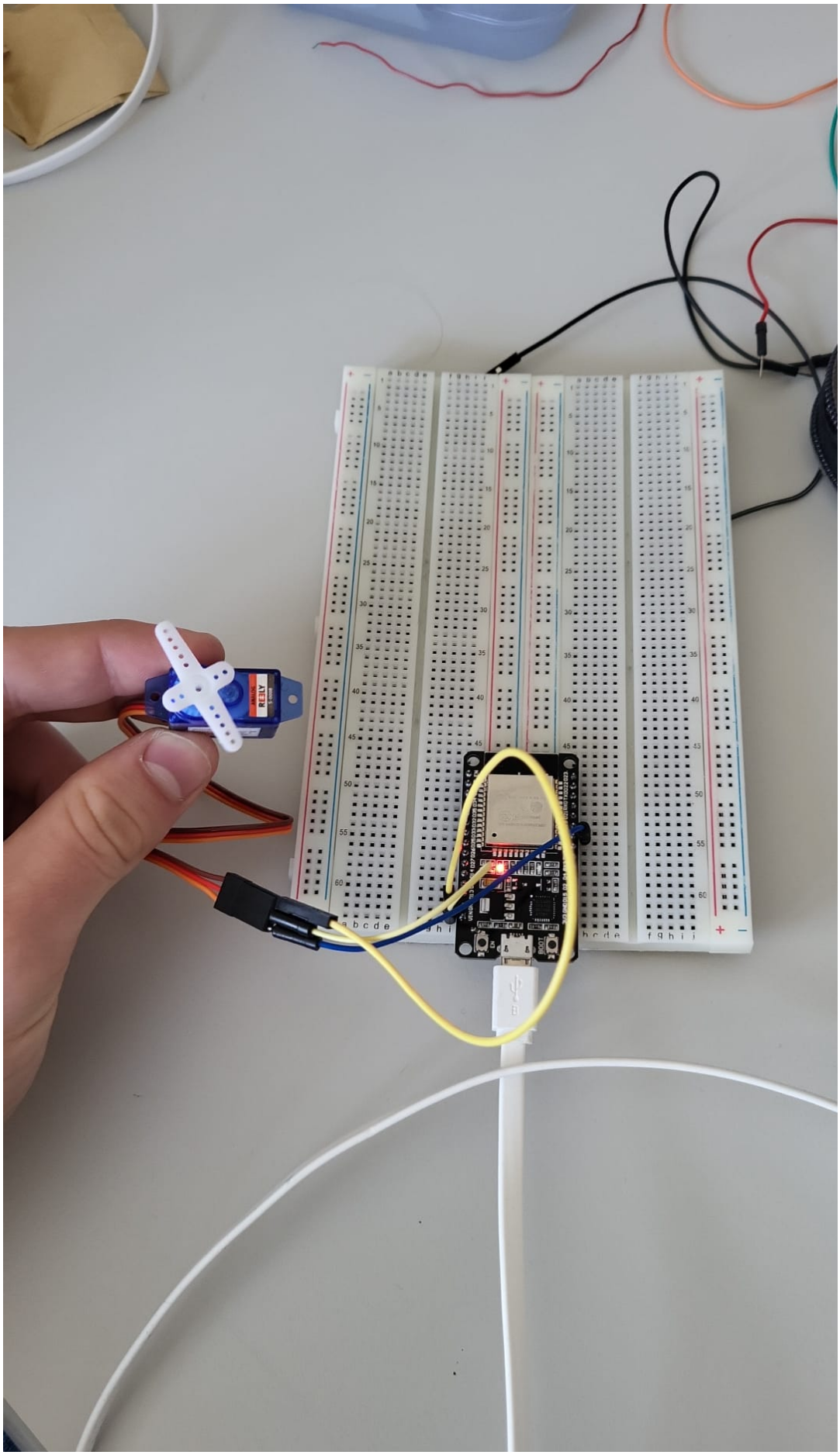
- **Orange** – The PWM servo control input. This is a logic-level signal, and most servo motors can accept 3.3-volt logic as well as 5-volt logic. Some models, especially 270-degree rotation servos, use a White wire for this connection.
- **Red** – The servo motor power supply input. Generally 5-6 volts DC, but be sure to check first.
- **Brown** – The ground connection. On some servo motors, this is a Black wire.



1. Schliesse den Braunen(Ground) anschluss zum GND an

2. Den Roten(Power) zum VIN

3. Und den Orangenen(Controll) zum D18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Code zum Testen

```
/* Sweep
 by BARRAGAN <http://barraganstudio.com>
 This example code is in the public domain.

 modified 8 Nov 2013
 by Scott Fitzgerald

 modified for the ESP32 on March 2017
 by John Bennett

 see http://www.arduino.cc/en/Tutorial/Sweep for a description of the

 * Different servos require different pulse widths to vary servo angle
 * an approximately 500-2500 microsecond pulse every 20ms (50Hz). In g
 * sweep 180 degrees, so the lowest number in the published range for
 * represents an angle of 0 degrees, the middle of the range represent
 * of the range represents 180 degrees. So for example, if the range i
 * 1000us would equal an angle of 0, 1500us would equal 90 degrees, ar
 * degrees.
 *
 * Circuit: (using an ESP32 Thing from Sparkfun)
 * Servo motors have three wires: power, ground, and signal. The power
 * the ground wire is typically black or brown, and the signal wire is
 * orange or white. Since the ESP32 can supply limited current at only
 * considerable power, we will connect servo power to the VBat pin of
 * near the USB connector). THIS IS ONLY APPROPRIATE FOR SMALL SERVOS.
 *
 * We could also connect servo power to a separate external
 * power source (as long as we connect all of the grounds (ESP32, serv
 * In this example, we just connect ESP32 ground to servo ground. The
 * connect to any available GPIO pins on the ESP32 (in this example, w
 *
 * In this example, we assume a Tower Pro MG995 large servo connected
 * The published min and max for this servo is 1000 and 2000, respecti
 * These values actually drive the servos a little past 0 and 180, so
 * if you are particular, adjust the min and max values to match your
 */

#include <ESP32Servo.h>

Servo myservo;  // create servo object to control a servo
// 16 servo objects can be created on the ESP32

int pos = 0;    // variable to store the servo position
```

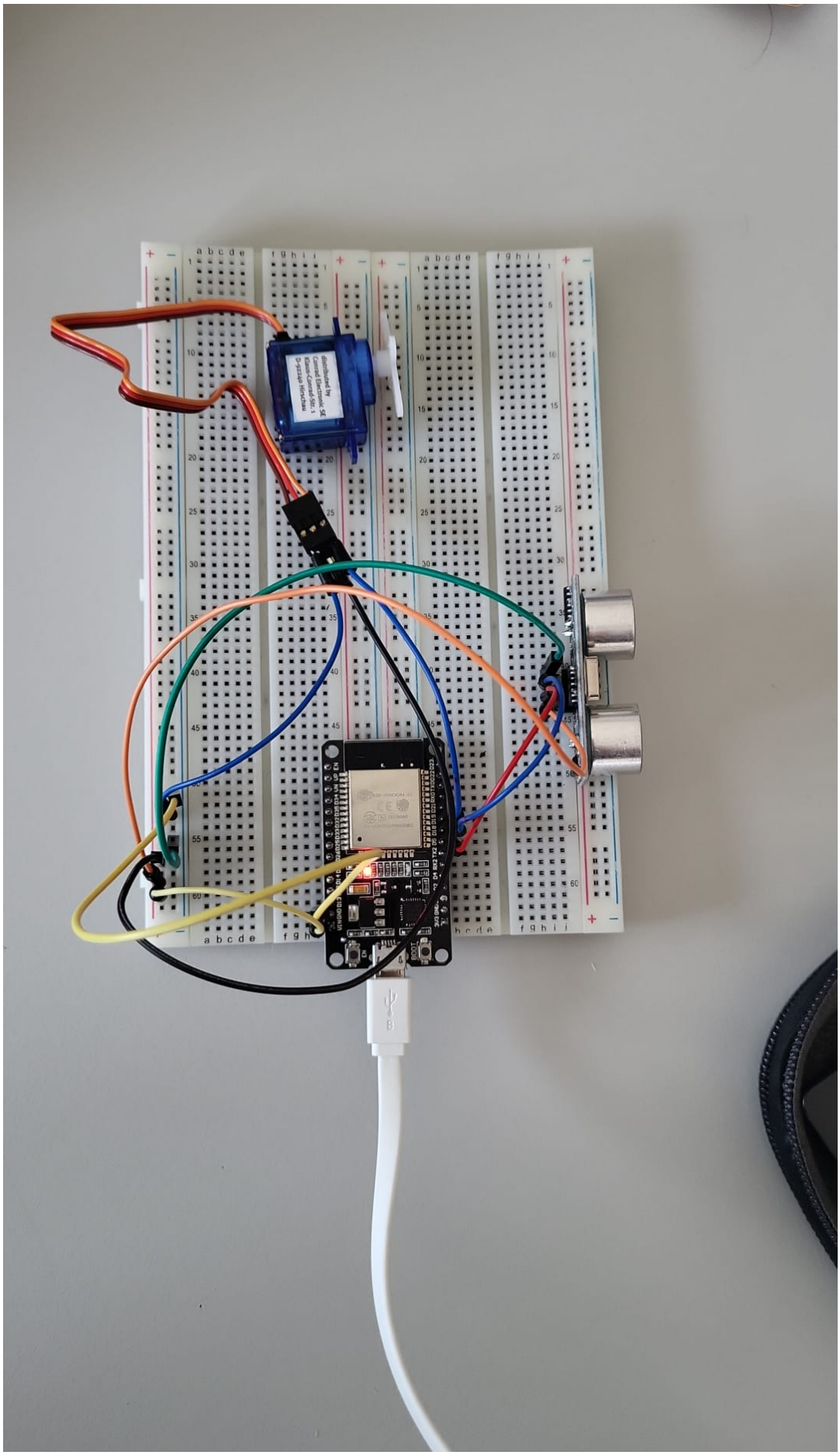
```
// Recommended PWM GPIO pins on the ESP32 include 2,4,12-19,21-23,25-2
int servoPin = 18;

void setup() {
    // Allow allocation of all timers
    ESP32PWM::allocateTimer(0);
    ESP32PWM::allocateTimer(1);
    ESP32PWM::allocateTimer(2);
    ESP32PWM::allocateTimer(3);
    myservo.setPeriodHertz(50);    // standard 50 hz servo
    myservo.attach(servoPin, 500, 2400); // attaches the servo on pin
    // using default min/max of 1000us and 2000us
    // different servos may require different min/max settings
    // for an accurate 0 to 180 sweep
}

void loop() {

    for (pos = 0; pos <= 180; pos += 1) { // goes from 0 degrees to 18
        // in steps of 1 degree
        myservo.write(pos);    // tell servo to go to position in vari
        delay(15);             // waits 15ms for the servo to reach th
    }
    for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to
        myservo.write(pos);    // tell servo to go to position in vari
        delay(15);             // waits 15ms for the servo to reach th
    }
}
```

Stecke jetzt den Ultraschalssensor eneut an



Code:

```
#define SOUND_SPEED 0.034
#define CM_TO_INCH 0.393701
#include <ESP32Servo.h>
long duration;
int distanceCm;
float distanceInch;
Servo myservo;  // create servo object to control a servo
// 16 servo objects can be created on the ESP32

int pos = 0;    // variable to store the servo position
// Recommended PWM GPIO pins on the ESP32 include 2,4,12-19,21-23,25-2
int servoPin = 19;
const int trigPin = 5;
const int echoPin = 18;

void setup() {
  Serial.begin(115200); // Starts the serial communication
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  // Allow allocation of all timers
  ESP32PWM::allocateTimer(0);
  ESP32PWM::allocateTimer(1);
  ESP32PWM::allocateTimer(2);
  ESP32PWM::allocateTimer(3);
  myservo.setPeriodHertz(50);    // standard 50 hz servo
  myservo.attach(servoPin, 500, 2400); // attaches the servo on pin 18
  // using default min/max of 1000us and 2000us
  // different servos may require different min/max settings
  // for an accurate 0 to 180 sweep
}

void loop() {

  // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  // Reads the echoPin, returns the sound wave travel time in microsec
  duration = pulseIn(echoPin, HIGH);
```

```
  // Calculate the distance
  distanceCm = duration * SOUND_SPEED/2;

  // Convert to inches
  distanceInch = distanceCm * CM_TO_INCH;

  // Prints the distance in the Serial Monitor
  Serial.print("Distance (cm): ");
  Serial.println(distanceCm);
  Serial.print("Distance (inch): ");
  Serial.println(distanceInch);


  myservo.write(distanceCm*5);
  delay(100);

}
```

3: Kalibrierung

Stecke den Ultraschallsensor erneut an

```
/*********
  Rui Santos
  Complete project details at https://RandomNerdTutorials.com/esp32-hc

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  of this software and associated documentation files.

  The above copyright notice and this permission notice shall be inclu
  copies or substantial portions of the Software.
*********/

const int trigPin = 5;
const int echoPin = 18;

//define sound speed in cm/uS
#define SOUND_SPEED 0.034

float startTime;
float minD = 90000.00;
float maxD = 0.0;
```

```
float lastDistance = 0.0;


void setup() {
  Serial.begin(115200); // Starts the serial communication
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  pinMode(2, OUTPUT);

  lastDistance = distance(true);

  digitalWrite(2, HIGH);   // turn the LED on (HIGH is the voltage lev
  startTime = millis();
  while(millis() - startTime <= 10000){
    float cDis = distance(false);
    if(cDis < minD && !(cDis > 400)) {
        minD = cDis;
    }
    if(cDis > maxD && !(cDis > 400) ){
      maxD = cDis;
    }
    delay(300);
    Serial.println(cDis);
  }

  digitalWrite(2, LOW);   // turn the LED off (LOW is the voltage leve

  Serial.print("Minimale Distance (cm): ");
  Serial.println(minD);
  Serial.print("Maximal Distance (cm): ");
  Serial.println(maxD);

  /**
  delay(1000);
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  // Reads the echoPin, returns the sound wave travel time in microsec
 float duration = pulseIn(echoPin, HIGH);

  // Calculate the distance
 float distanceCm = duration * SOUND_SPEED/2;
```

```
 Serial.print(distanceCm);
 */
}

float distance(boolean firstTime) {
// Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  // Reads the echoPin, returns the sound wave travel time in microsec
 float duration = pulseIn(echoPin, HIGH);

  // Calculate the distance
 float distanceCm = duration * SOUND_SPEED/2;
 if(firstTime == False) {
  if(distanceCm <= lastDistance * 1.2 && distanceCm >= lastDistance *
    lastDistance = distanceCm;
  }
 }




  return lastDistance;
}

void loop() {
  /**
  float cDis = distance();
  if((cDis >= minD) && (cDis <= maxD)) {
    Serial.print("Distance (cm): ");
    Serial.println(cDis);
  }
  delay(1000);
  */
}
```

4: Luftfeuchtigkeit

Code:

```
#include "DHT.h"
const int trigPin = 5;
const int echoPin = 18;
const int ledPin = 2;
#define SOUND_SPEED 0.03316
long duration;
float distanceCm;
float exactSoundSpeed;
float exactDistance;
float minVal = 1000.0;
float maxVal = 0.0;
DHT dht(19, DHT11);
void setup() {
Serial.begin(115200);
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
dht.begin();

}
void loop() {
digitalWrite(trigPin, LOW);

delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distanceCm = duration * SOUND_SPEED/2;
delay(500);
float temp = dht.readTemperature();
float hum = dht.readHumidity();
if(isnan(temp) || isnan(hum))
return;
exactSoundSpeed = SOUND_SPEED * (1+0.00375*hum/100) + 0.00006*temp;
exactDistance = duration * exactSoundSpeed / 2;
if(distanceCm >= 2 && distanceCm <= 400) { // Ausreißer filtern
if(millis() <= 10000) { // Kalibrierungsphase
minVal = distanceCm < minVal ? distanceCm : minVal;
maxVal = distanceCm > maxVal ? distanceCm : maxVal;
} else {
digitalWrite(ledPin, LOW);
}
Serial.print("Distanz:");
Serial.print(distanceCm);
```

```
Serial.print("Distanz mit Temperatur und Luftfeuchtigkeit:");
Serial.println(exactDistance);
}
}
```

5: Genauigkeit

Code:

```
#include "DHT.h"
const int trigPin = 5;
const int echoPin = 18;
const int ledPin = 2;
#define SOUND_SPEED 0.03316
long duration;
float distanceCm;
float exactSoundSpeed;
float exactDistance;
float correctedDistance;
float minVal = 1000.0;
float maxVal = 0.0;
DHT dht(19, DHT11);
void setup() {
Serial.begin(115200);
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
dht.begin();
}
void loop() {
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distanceCm = duration * SOUND_SPEED/2;
delay(500);
float temp = dht.readTemperature();
float hum = dht.readHumidity();
if(isnan(temp) || isnan(hum))
return;
exactSoundSpeed = SOUND_SPEED * (1+0.00375*hum/100) + 0.00006*temp;
```

```
exactDistance
= duration * exactSoundSpeed / 2;
if(distanceCm >= 2 && distanc

eCm <= 400) {

if(millis() <= 10000) {
minVal = distanceCm < minVal ? distanceCm : minVal;
maxVal = distanceCm > maxVal ? distanceCm : maxVal;
} else {
digitalWrite(ledPin, LOW);
}
correctedDistance = exactDistance <= 50 ? exactDistance : exactDistanc
Serial.print("Distanz:");
Serial.print(exactDistance);
Serial.print("Distanz mit minimiertem Fehler:");
Serial.println(correctedDistance);
}
}
```