
# PROJECT Nº 4: Avoid obstacles

Learn how to create a program so that, when the Code&Drive ultrasonic sensor detects an object or plain surface 25 cm or less away, turns on the LEDs, moves backwards and turns to avoid it. Once it has avoided the object, it will keep moving forward in a straight line.

**DIFFICULTY LEVEL**: Intermediate.

**DURATION OF THE EXERCISE:** 40 min.

**MATERIALS**:

- 1 Green LED
- 1 Red LED

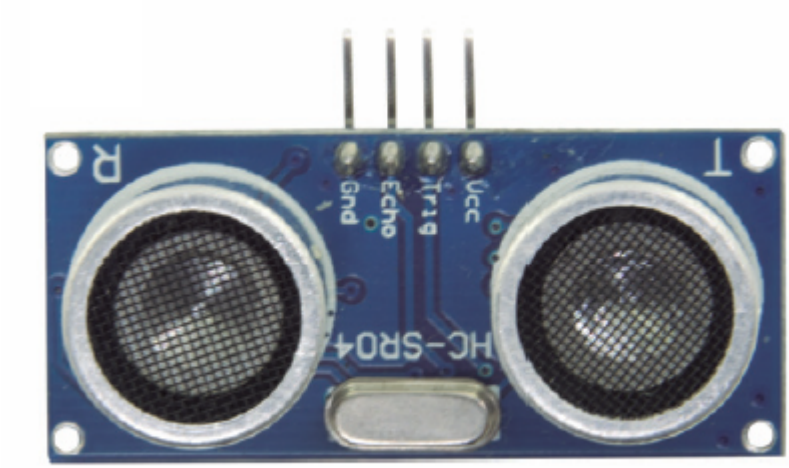
- 1 Ultrasonic sensor
- 2 DC motors with their wheels
- 1 USB – Micro USB cable
- Computer

The Code&Drive will have to be built according to the instructions manual.

# What is an ultrasonic sensor?

An ultrasonic sensor is a device to measure the distance. It functions by sending a high frequency sound pulse, not audible to the human ear. This pulse bounces on near objects and it’s reflected towards the sensor, that has a microphone suitable for this frequency.

By measuring the time between pulses and knowing the speed of the sound, we can estimate the distance of the object, on whose surface has bounced the sound pulse.



Ultrasonic sensor

**CONNECTIONS**:

1. Connect the LEDs to the digital pins “9” and “10”.
2. Connect the ultrasonic sensor to the digital pins “12” and “13”.
3. Connect the DC motors to the grey connector of the Build&Code 4in1 board.

**PROGRAMMING CODE**

You can do this project using the Arduino, Bitbloq and other visual programming software by blocks compatible. Below you will find the necessary code.

**Arduino Code**

1. Download and install the Arduino IDE program. It is available for Windows, Mac OS and Linux.
2. Open the Arduino program and copy the following program in it:

```
int PinSpeedMA = 5, PinSpeedMB = 6; // DIGITAL PIN
FOR THE SPEED OF THE MOTORS
int PinTurnMA = 4, PinTurnMB = 7; // DIGITAL PIN FOR
DIRECTION OF THE MOTORS
int TrigPin = 13;  // ULTRASONIC SENSOR PINS
int EchoPin = 12;
float SSound = 0.0343;  // SOUND SPEED IN cm/us
long Lengh, Distance ;  // VARIABLES TO CALCULATE THE
DISTANCE IN cm
int PinLED1 = 9, PinLED2 = 10; // LED1 AND LED2
DIGITAL PINS

void setup() {
  // put your setup code here, to run once:
  //CONFIGURATION OF THE DIGITAL PORTS
  pinMode(PinSpeedMA, OUTPUT);
  pinMode(PinSpeedMB, OUTPUT);
  pinMode(PinTurnMA, OUTPUT);
  pinMode(PinTurnMB, OUTPUT);
  pinMode(TrigPin, OUTPUT);
  pinMode(EchoPin, INPUT);
  pinMode(PinLED1, OUTPUT);
  pinMode(PinLED2, OUTPUT);
  // SPEED OF THE MOTORS  100 TO 255
  analogWrite(PinSpeedMA, 175);
  analogWrite(PinSpeedMB, 175);
}

void loop() {
  // put your main code here, to run repeatedly:
  DistanceCM(); // CALL THE FUNCTION TO CALCULATE THE
DISTANCE
  if (( Distance < 25) && ( Distance > 1)) // IF THE
DISTANCE IS BETWEEN 1 AND 25CM
    {
```

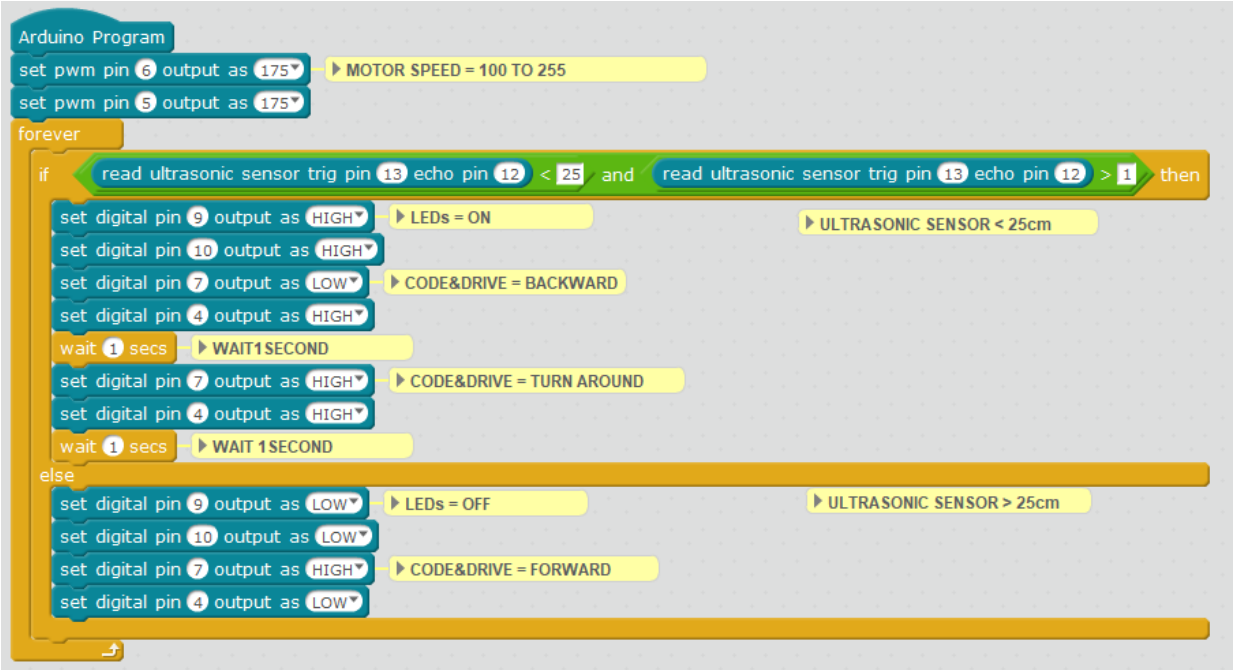
```
      digitalWrite(PinLED1,HIGH);//LED1 Y LED2 = ON
      digitalWrite(PinLED2,HIGH);
       digitalWrite(PinTurnMA, HIGH);// CODE&DRIVE
BACKWARD
      digitalWrite(PinTurnMB, LOW);
      delay(1000);
       digitalWrite(PinTurnMA, HIGH);// CODE&DRIVE
ROTATION
      digitalWrite(PinTurnMB, HIGH);
      delay(1000);
    }
    else
    {
      digitalWrite(PinLED1,LOW);// LED1 Y LED2 = OFF
      digitalWrite(PinLED2,LOW);
       digitalWrite(PinTurnMA, LOW); // CODE&DRIVE
FORWARD
      digitalWrite(PinTurnMB, HIGH);
    }
}

void DistanceCM()// DISTANCE CALCULATION FUNCTION
{
  // CALCULATE THE DISTANCE IN CM
  digitalWrite(TrigPin, LOW);         // VERIFY THAT
THE TRIGGER IS DEACTIVATED
  delayMicroseconds(4);               // VERIFY THAT
THE TRIGGER IS LOW
  digitalWrite(TrigPin, HIGH);       // ACTIVATE THE
OUTPUT PULSE
  delayMicroseconds(14);               // WAIT 10µs.
PULSE REMAINS ACTIVE DURING
  digitalWrite(TrigPin, LOW);         // STOP PULSE
AND WAIT FOR ECHO
   Lengh = pulseIn(EchoPin, HIGH) ; // pulseIn
MEASURES THE TIME THAT TAKES TO THE DECLARED PIN
(echoPin) TO CHANGE FROM LOW TO HIGH STATUS (FROM 0
TO 1)
   Distance = SSound* Lengh / 2;   // CALCULATE
DISTANCE
```

**Code for the visual programming software by blocks compatible**

1. Download and install the program.

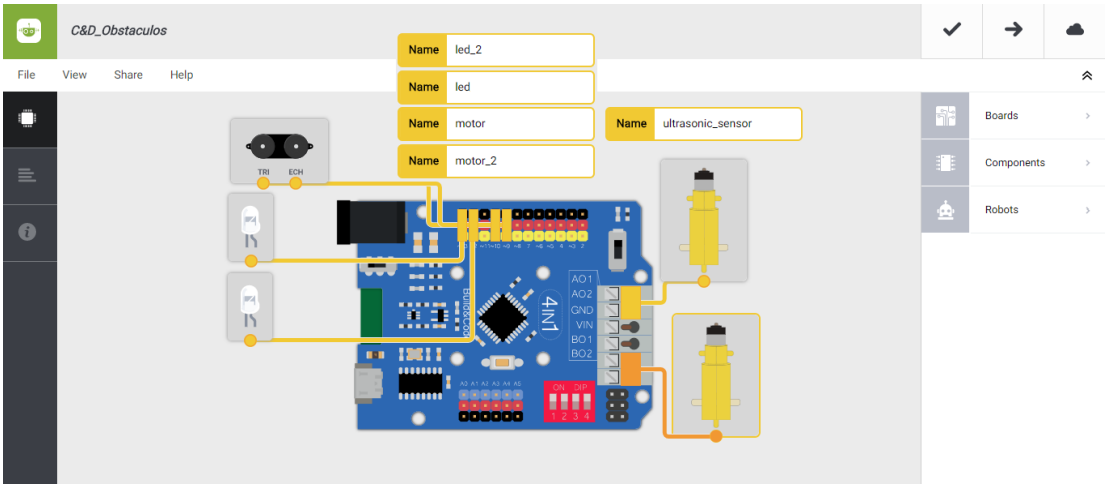
2. Open the software and copy the following code. Use the following image as a guide:



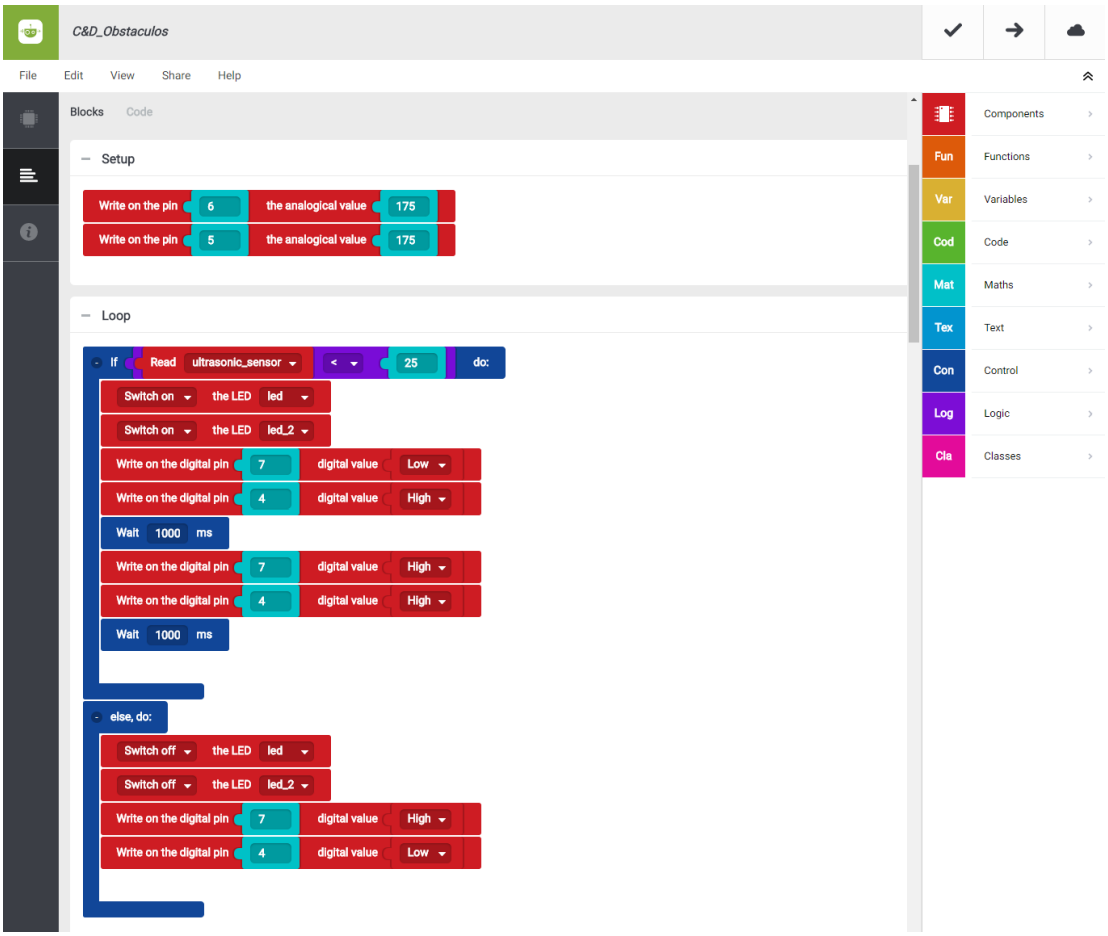

3. Configure and upload the code, following the indications on the Code&Drive First Steps guide.
4. Check that the BTL/USB switch on the Build&Code 4in1 board is set to USB, to upload the code correctly.

## Bitbloq code

1. Download Bitbloq and install the Web2board app.
2. Open the software and copy the following code.
    - **Hardware**




    - **Software**




3. Configure and upload the code, following the indications on the Code&Drive First Steps guide.
4. Check that the BTL/USB switch on the Build&Code 4in1 board is set to USB, to upload the code correctly.

## RESULT OF THE EXERCISE

The Code&Drive will go straight forward. When the ultrasonic sensor detects an object less than 25 cm away, the Code&Drive will turn its LEDs on, go back for 1 second and turn around for another second. Then, it will check that there are no obstacles, turn the LEDs off and continue to go straight forward.