ROBOSTEM Project

Agreement no: 2019-1-RO01-KA202-063965

Erasmus+

Lesson Plan - Computer Science

Subject: Alternative instruction IF - application in programming an ultrasonic security system

Target group: 9th grade students (beginners)

Objectives / Skills

Obj1. Explanation of the operation of the alternative instruction IF and nested IFs
Obj2. Building the Arduino device
Obj3. Implement the device code using the IF statement
Obj4. Device functionality testing

Teaching methods: conversation, explanation, problem solving, algorithm design, demonstration

Educational Means / Tools / Technologies

Calculator, Internet, online Arduino editor,
Project components (Arduino Uno x 1, breadboard x 1, ultrasonic sensor x 1, red x 1 LEDs, yellow x 1, green 1 x 1, resistor x 1, cables x 10)

Projecting the activity

The students will be divided into 3 teams that will make the device in parallel and present it. In each team of 10 students there will be students who will build the device and students who will program it.

Duration	Activity	Methods/means
5 min	Introduction of the IF alternative instruction. Explain the C ++ syntax and the principle of execution. Nested IFs, ELSE association rules.	Explication, conversation
5 min	Presentation of the ultrasonic security device (Step 1 - appendix)	Problem solving, Explication, conversation
20 min	Device construction (Step 2- Step 6 appendix)	Problem solving, Explication, conversation
15 min	Device programming	Algorithm design
5 min	Testing the functionality of the device	Demonstration

Evaluation/Feedback:

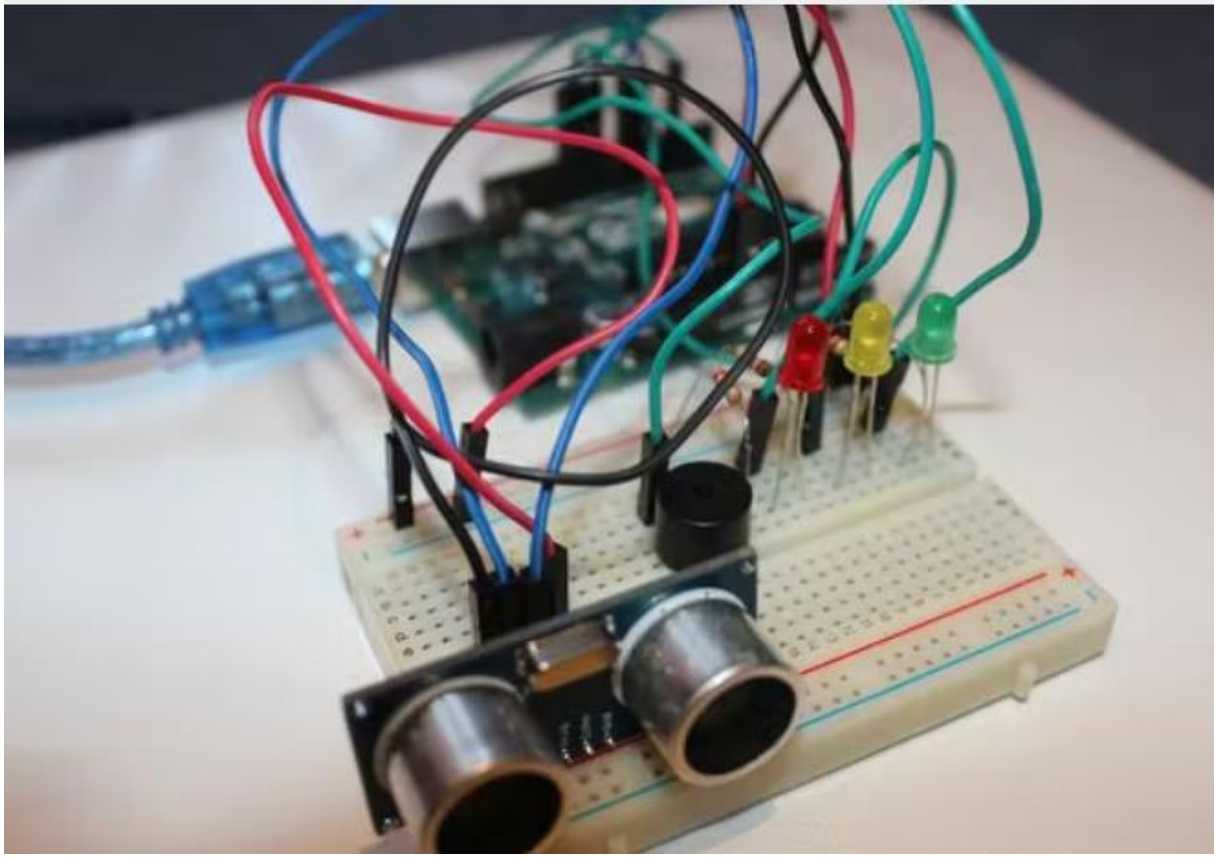
Test the functionality of the device for each situation implemented by the IF instructions (positioning at different distances and checking the light and sound signals).

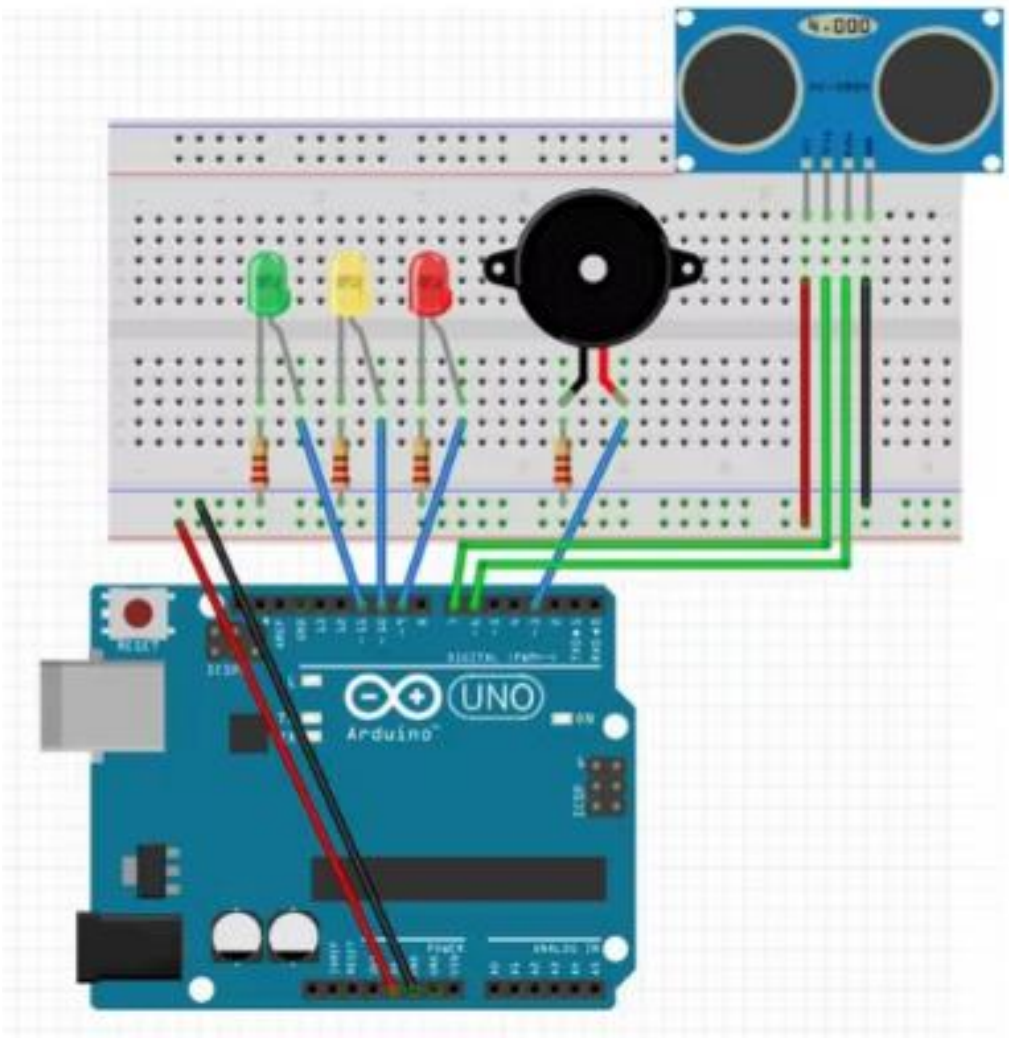
Bibliography/Webography:

https://create.arduino.cc/projecthub/Krepak/ultrasonic-security-system-3afe13?ref=tag&ref_id=kids&offset=3

Annex 1

Step 1: Presenting the device



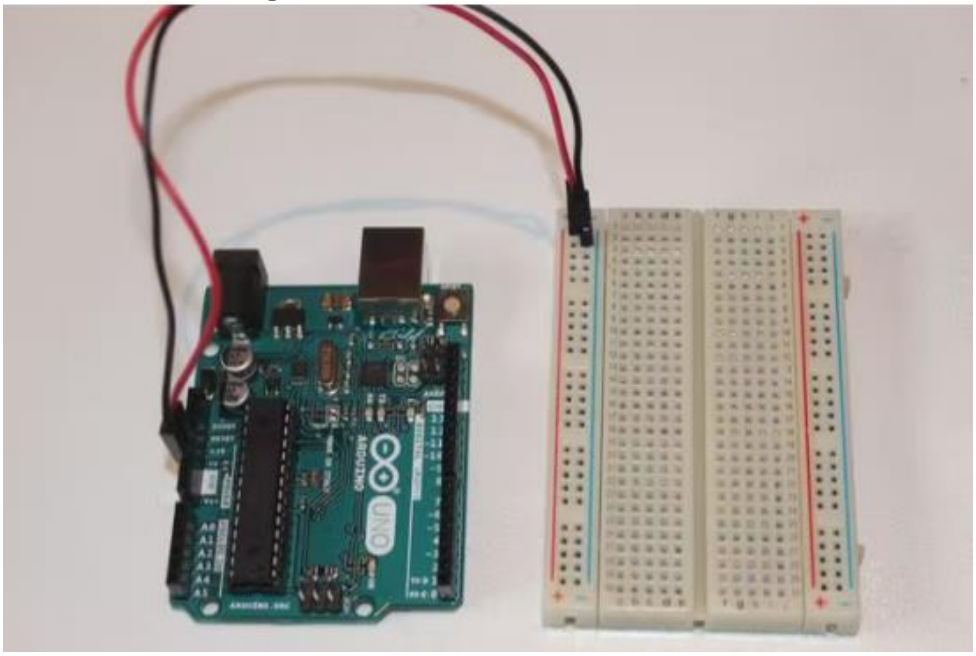


Step 2: Connect:

- The red cable from pin 5V to the positive channel on the breadboard
- The black cable from the GND pin on Arduino to the negative channel of the breadboard
- Buzzer = pin 7
- Ultrasonic Sensor:
  - Echo = pin 3
  - Trig = pin 2
- LEDs:
  - RedLED = pin 4
  - YellowLED = pin 5
  - GreenLED = pin 6

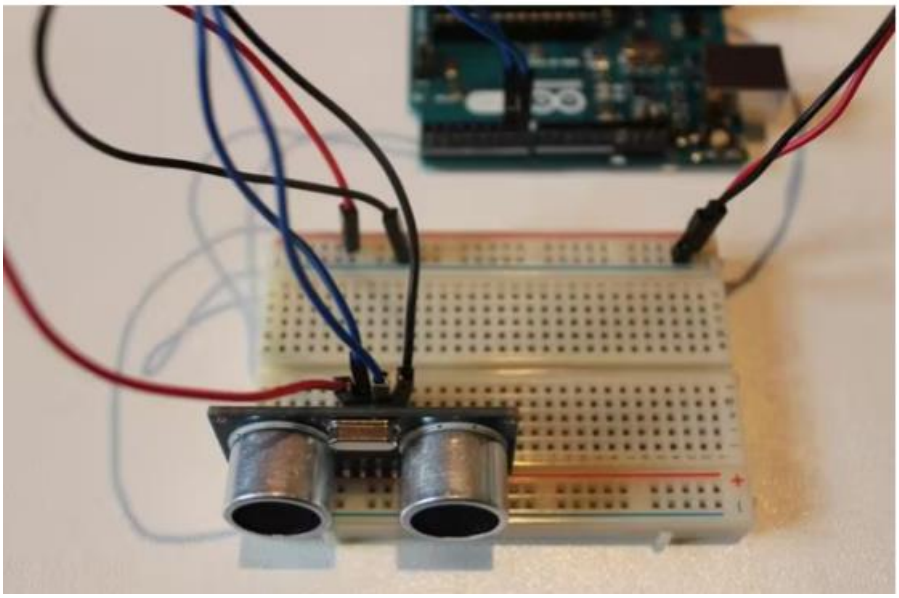
The green cables connect the LEDs in line as follows: Positive LED with negative LED to the negative channel on the breadboard, using a 220 ohm resistor

Step 3: Assembly the Breadboard



First 5V and GND pin from Arduino to the breadboard.

Step 4: Assembly - Ultrasonic Sensor



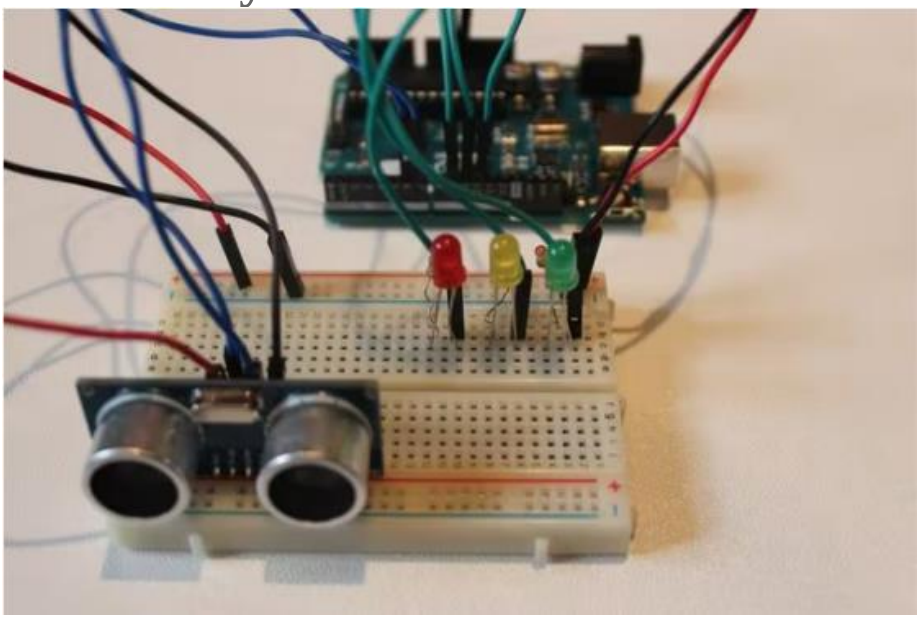
HC-SRO4 ultrasonic sensor! Place the ultrasonic sensor face up as far right as possible.

Connect:

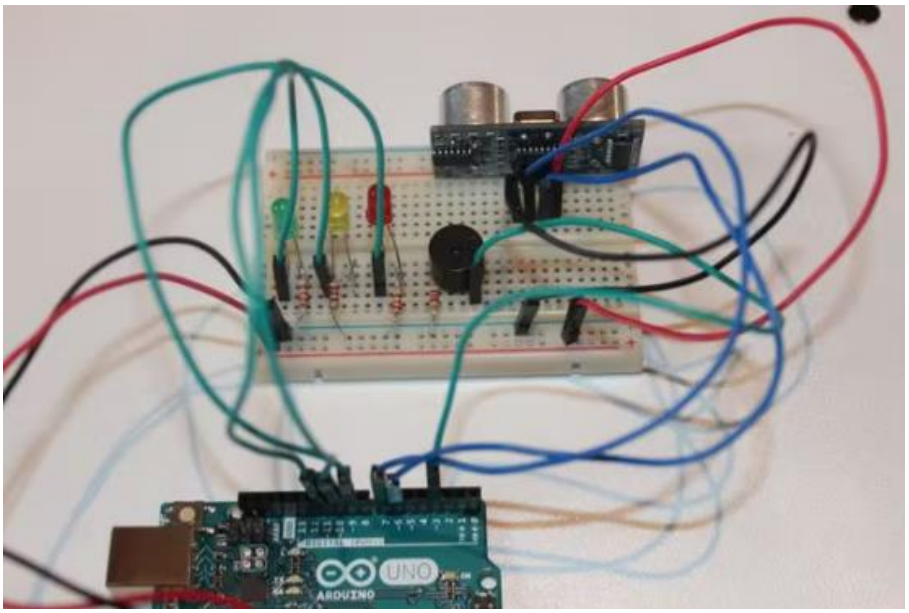
- GND pin from the ultrasonic sensor to the negative channel on the breadboard.
- Trig pin on the sensor to pin 2 from Arduino

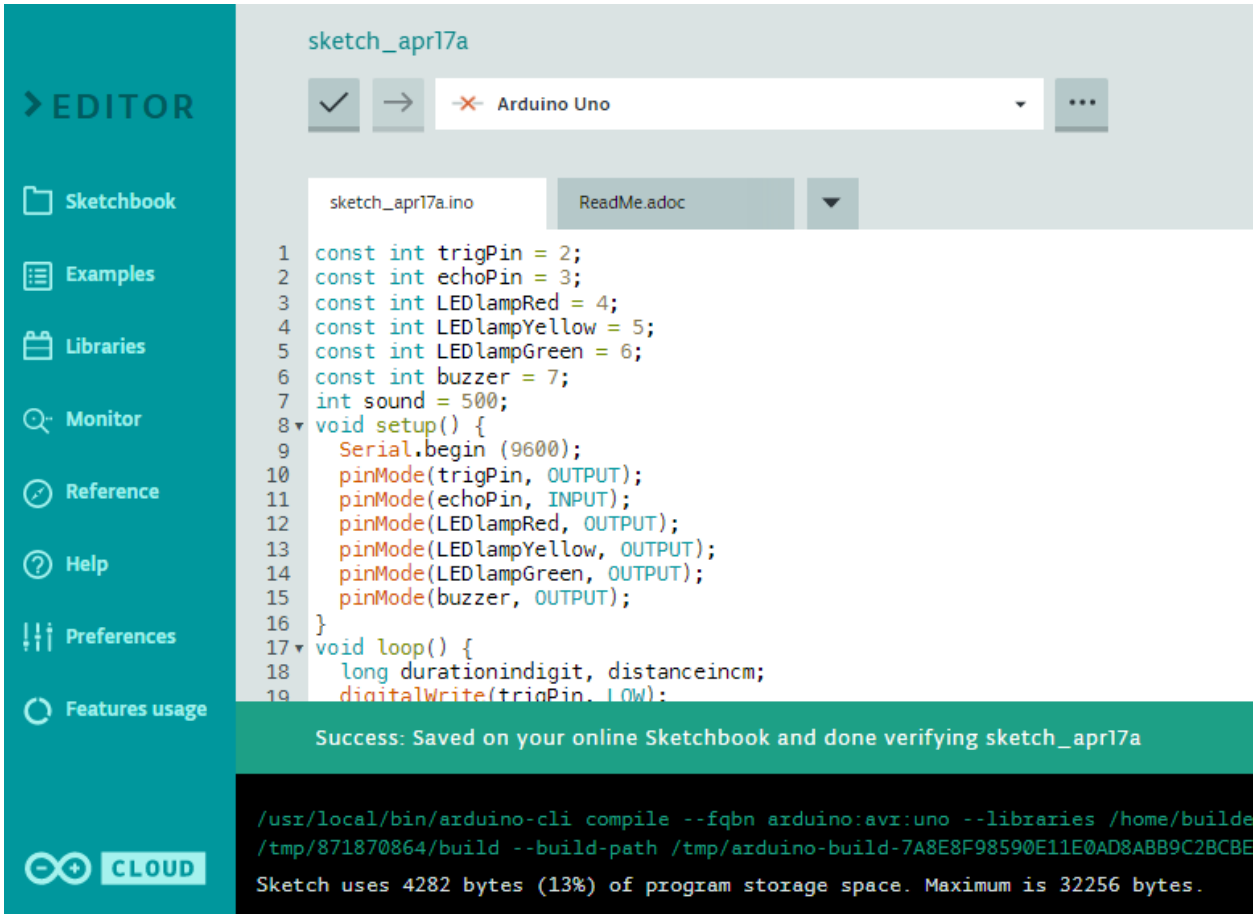
- Echo pin on sensor to pin 3 on Arduino.
- VCC pin on the ultrasonic sensor to the positive channel on breadboard.

Step 5: Assembly - LEDs



Step 6: Assembly – Buzzer






```
const int trigPin = 2;
const int echoPin = 3;
const int LEDlampRed = 4;
const int LEDlampYellow = 5;
const int LEDlampGreen = 6;
const int buzzer = 7;
int sound = 500;
void setup() {
  Serial.begin (9600);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(LEDlampRed, OUTPUT);
  pinMode(LEDlampYellow, OUTPUT);
  pinMode(LEDlampGreen, OUTPUT);
  pinMode(buzzer, OUTPUT);
}
void loop() {
  long durationindigit, distanceincm;
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
```

```
  digitalWrite(trigPin, LOW);
  durationindigit = pulseIn(echoPin, HIGH);
  distanceincm = (durationindigit * 0.034) / 2;
  if (distanceincm > 50) {
    digitalWrite(LEDlampGreen, LOW);
    digitalWrite(LEDlampYellow, LOW);
    digitalWrite(LEDlampRed, LOW);
    noTone(buzzer);
  }
  else if (distanceincm <= 50 && distanceincm > 20) {
    digitalWrite(LEDlampGreen, HIGH);
    digitalWrite(LEDlampYellow, LOW);
    digitalWrite(LEDlampRed, LOW);
    noTone(buzzer);
  }
  else if (distanceincm <= 20 && distanceincm > 5) {
    digitalWrite(LEDlampYellow, HIGH);
    digitalWrite(LEDlampGreen, HIGH);
    digitalWrite(LEDlampRed, LOW);
    tone(buzzer, 500);
  }
  else if (distanceincm <= 0) {
    digitalWrite(LEDlampGreen, LOW);
    digitalWrite(LEDlampYellow, HIGH);
    digitalWrite(LEDlampRed, LOW);
    noTone(buzzer);
}
  else {
    digitalWrite(LEDlampGreen, HIGH);
    digitalWrite(LEDlampYellow, HIGH);
    tone(buzzer, 1000);
    digitalWrite(LEDlampRed, HIGH);
    delay(300);
    digitalWrite(LEDlampRed, LOW);
  }
  Serial.print(distanceincm);
  Serial.println(" cm");
  delay(300);
}
```