Ministry of Education and Science of Ukraine

Odessa National Academy of Food Technologies

International Competition of Student Scientific Works

BLACK SEA SCIENCE 2021

Information Technology, Automation and Robotics

Proceedings

Odessa, ONAFT 2021

UDC 004.01/08

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Black Sea Science 2021: Proceedings of the International Competition of Student Scientific Works. Information Technology, Automation and Robotics. / Odessa National Academy of Food Technologies; B.Yegorov, M. Mardar, S.Kotlyk (editors-in-chief.) [*et al.*]. – Odessa: ONAFT, 2021. – 526 p.

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```
int val;    // variable to read the value from the analog pin
 void setup()
{
  myservo.attach(9);  // attaches the servo on pin 9 to the servo object
}
 void loop()
{
  val = analogRead(potpin);            // reads the value of the potentiometer
(value between 0 and 1023)
  val = map(val, 0, 1023, 0, 179);     // scale it to use it with the servo (value
between 0 and 180)
  myservo.write(val);                  // sets the servo position according to the
scaled value
  delay(15);                           // waits for the servo to get there
}
```

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ATDH-REMOTE

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Abstract. *The paper considers the hardware and software of the developed ATDH-Remote device based on the Arduino UNO board. The operation of sensors that can measure body temperature and environment, humidity, atmospheric pressure, as well as automated antiseptic spraying is described.*

Keywords: *Arduino UNO, sensors, infrared jammer, non-contact thermometer, barometer.*

I. INTRODUCTION

The development of technology, automation and robotization of production makes a significant contribution to the lives of people in the XXI century. It is impossible to imagine the life of modern society without various mechanisms that simplify, improve performance or completely replace a person in a particular field of

activity.

Due to the spread of coronavirus infection COVID-19, the urgent issue is to combat the disease, to find ways to ensure personal hygiene, to prevent contact with people with signs of the disease. Antiseptics, non-contact thermometers, have become a mandatory tool to prevent the spread of the disease. That is why, in order to avoid tactile interaction with protective equipment, it was decided to create a device that will measure temperature by non-contact method, disinfect hands when raising them to the technical hole and display information about temperature, humidity on the display.

II. LITERATURE ANALYSIS

The issues of development of technical and creative thinking due to design activity were considered by a number of scientists: G. Altshuller, A. Davydenko, T. Kudriavev, E. Millerian, V. Moliako, I. Roitman, P. Jacobson and others. P. Andre, F. Lot, J.-P. Tayar [1], A. Korendiasev [5], J. Williams [7], S. Monk [8]. studied the control systems of robotics, as well as technical systems and complexes.

III. OBJECT, SUBJECT AND METHODS OF RESEARCH

The object of research is the operation of sensors based on the Arduino UNO board.

The subject of the research is an automated sensor control system based on the Arduino UNO board.

The aim of the work is to develop a device based on the Arduino UNO board, which will allow contactless contact with humans to measure the temperature of the object and the environment, humidity, atmospheric pressure, as well as automated spraying of antiseptics.

Research methods: analysis of components and methods of building automatic control systems for optimal selection of the most appropriate hardware, software development tools for the controller and human-machine interface, development of algorithms for controlling the operation of the object and implementation of these algorithms in software for the controller.

IV. RESULTS

The Arduino platform can be used to develop systems that control sensors and switches. Such systems, in turn, can control the operation of a wide range of indicators, motors and other devices. Arduino-based modules can be either stand-alone or interact with software running on a personal computer.

Table 1 shows the electronics that were used to implement the device at the hardware and software level.

The Arduino UNO R3 controller is selected to control the device. The *Atmega328p* microcontroller has additional *SDA and SCL* contacts (*I2C* interface), these outputs in our product are used to connect i2c devices: BME280 barometer, MLX90614 contactless thermometer module and 1602 + i2c LCD display module.

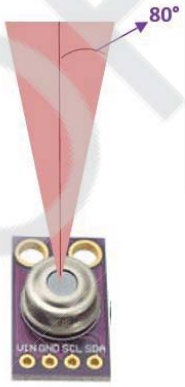
Barometer BME280 – measures room temperature, humidity and atmospheric pressure. Accuracy of temperature measurement is from 0.5 to 1° C, humidity measurement: 3%, pressure measurement: 1gPa.

Used electronics Table 1

№	Name	Quantity, items
1	Arduino UNO R3 ATmega328P	1
22	Barometer BME280	1
33	Water pump for immersion 3-6V 120 l/h	1
44	Infrared jammer (YL-63)	2
55	Laser module for Arduino	1
66	Contactless thermometer module MLX90614	1
77	Display module LCD 1602+i2c	1

The MLX90614 non-contact thermometer module is designed for non-contact measurement of the absolute temperature of the object, the ambient temperature for calibration of the value of the object temperature. Features of the MLX90614 sensor are as follows: object temperature range: from -70° C to 382.2° C; ambient temperature range: from -40° C to 125° C; expansion/accuracy: 0.02° C

One of the questions to which the technical characteristics do not give a direct answer is the measurement of the distance between the sensor and the object. The value of this distance is defined by the term Field of View (FOV), for our sensor the field of view is about 80°



The sensitivity range should be conical from the point of the sensor, as shown above. Thus, as you move away from the measuring object, the sensitivity zone doubles. That is, for every 1 cm we move away from the object, the sensitivity zone increases by 2 cm. In our device, we placed a laser diode next to the sensor to know where the sensitive area of the sensor is currently directed. During the tests, it was found that the values were reliable if the hand is placed at a distance of 2 cm from the device, and as you remove the accuracy decreases.

The connection diagram of the devices is shown in Figure 1

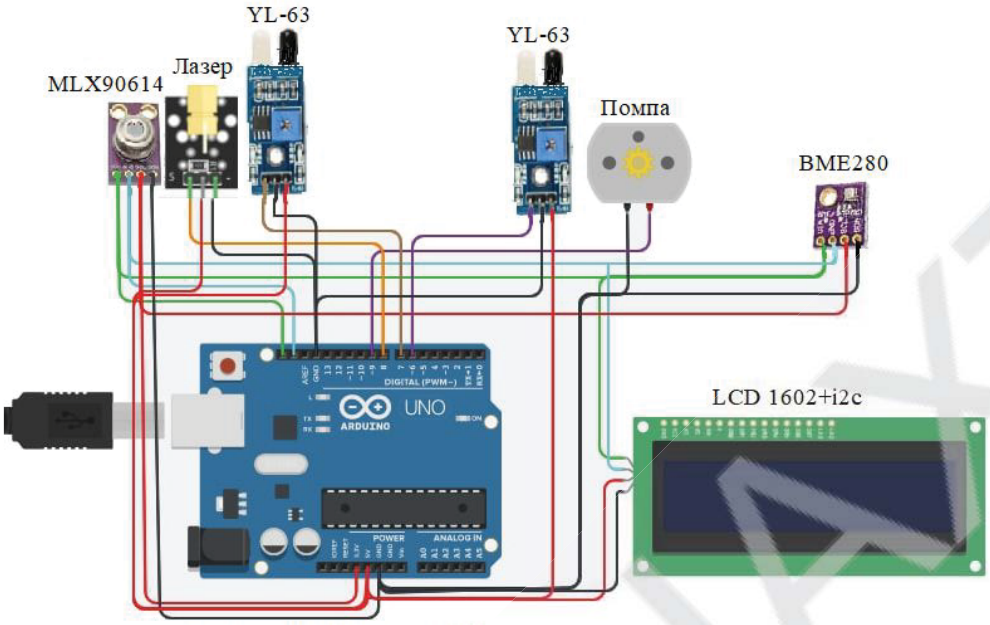
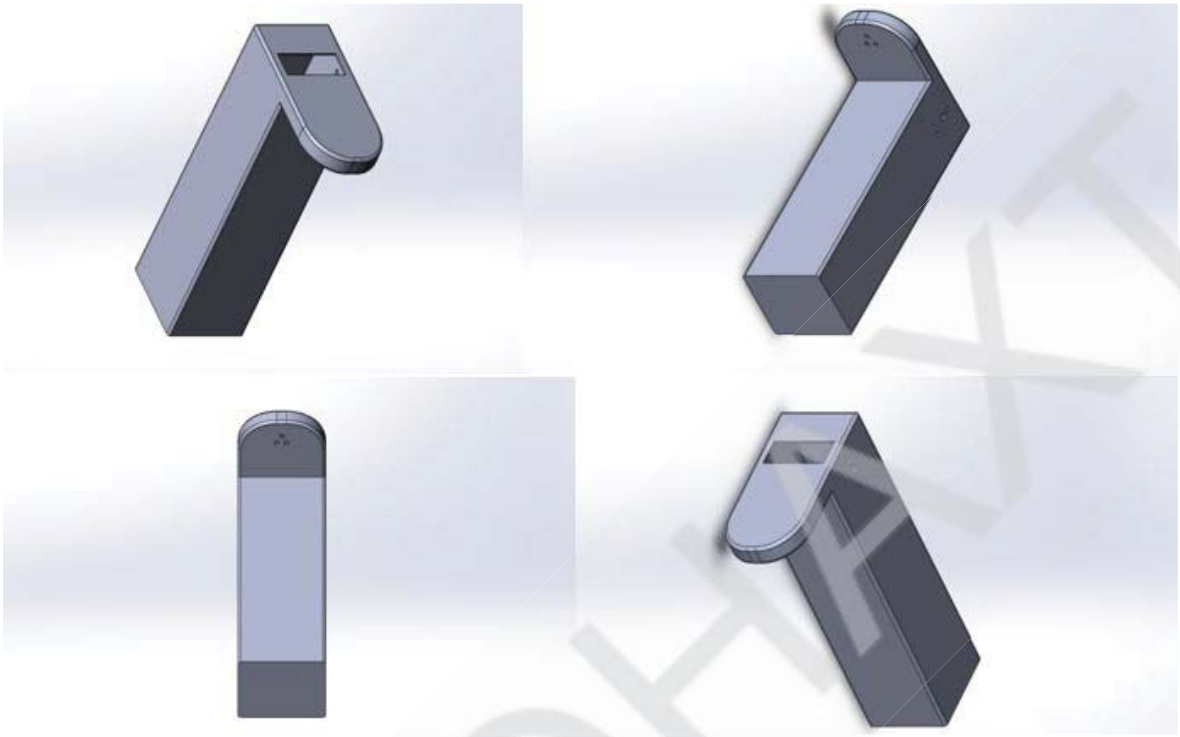


Photo of the device

3D model divice



The program for Arduino receives data from the BME280 sensor and displays on the LCD 1602 + i2c display. Upon receiving a signal from the YL-63 infrared jammer, the laser diode and the MLX90614 sensor, which outputs information to the LCD display module, starts operating. The water pump is immersed in a disinfectant solution and sprays a dose of solution when receiving a signal from another infrared jammer YL-63.

The full code of the device on the Arduino is presented below.

```
#include <Wire.h>
#include <SparkFunMLX90614.h>
#include <SPI.h>
#include <Adafruit_Sensor.h>
#include <Adafruit_BME280.h>
#include <LiquidCrystal_I2C.h>
#define SEALEVELPRESSURE_HPA (1013.25)

IRTherm therm; // Create an IRTherm object to interact with throughout
LiquidCrystal_I2C lcd_27(0x27, 16, 2);
Adafruit_BME280 bme; // I2C
unsigned long delayTime;

void setup()
{
  pinMode(7,INPUT);
```

```
  pinMode(6,INPUT);
  pinMode(8,OUTPUT);
  pinMode(9,OUTPUT);
  therm.begin();
  lcd_27.begin ();
  lcd_27.backlight();
  lcd_27.setCursor(1-1, 1-1);
  lcd_27.println(F("BME280 testing  "));//BME280 testing
  delay(2000);
  lcd_27.clear();
   if (! bme.begin(0x76, &Wire)) {
       lcd_27.print("not find BME280");
       while (1);
   }
  lcd_27.print("BME280 OK");
  delay(2000);
  lcd_27.clear();

  lcd_27.setCursor(1-1, 1-1);
  lcd_27.println(F("MLX90614 testing"));//MLX90614 testing
  delay(2000);
  lcd_27.clear();
  Wire.begin(); //Joing I2C bus
   if (therm.begin() == false){ // Initialize thermal IR sensor
     lcd_27.print("not find MLX90614");
     while(1);
   }
  lcd_27.print("MLX90614 OK");
  delay(2000);
  lcd_27.clear();


   therm.setUnit(TEMP_C); // Set the library's units to Farenheit
  // Alternatively, TEMP_F can be replaced with TEMP_C for Celsius or
  // TEMP_K for Kelvin.
  therm.setEmissivity(0.98);
  pinMode(LED_BUILTIN, OUTPUT); // LED pin as output
}

void loop()
{
   bme.takeForcedMeasurement(); // has no effect in normal mode
   BME280();
   delay(delayTime);
```

```
  if ((digitalRead(7))==0){  // 7 input signal starting MLX
    lcd_27.clear();
    digitalWrite(8,HIGH);
    MLX();
    delay(3000);
    lcd_27.clear();
    digitalWrite(8,LOW);
    delay(1000);
  }
  if ((digitalRead(6))==0){
    lcd_27.clear();
    lcd_27.setCursor(2-1, 1-1);
    lcd_27.print("Wait disinfect");
    lcd_27.setCursor(4-1, 2-1);
    lcd_27.print("you hands");
    digitalWrite(9,HIGH);
    delay(1000);
    digitalWrite(9,LOW);
    delay(2000);}
}

void BME280() {
    lcd_27.setCursor(1-1, 1-1);
    lcd_27.print("T=");
    lcd_27.print(bme.readTemperature());
    lcd_27.println(" ");
    lcd_27.setCursor(9-1, 1-1);
    lcd_27.print("H=");
    lcd_27.print(bme.readHumidity());
    lcd_27.println("%");
    lcd_27.setCursor(1-1, 2-1);
    lcd_27.print("P=");
    lcd_27.print(bme.readPressure() / 100.0F);
    lcd_27.print(" hPa");
}

void MLX(){
  digitalWrite(LED_BUILTIN, HIGH);
  lcd_27.setCursor(1-1, 1-1);
  lcd_27.print("You temperature");
  lcd_27.setCursor(1-1, 2-1);
  // Call therm.read() to read object and ambient temperatures from the sensor.
  if (therm.read()) // On success, read() will return 1, on fail 0.
  {
```

```
    lcd_27.print("now: " + String(therm.object(), 2));
    lcd_27.setCursor(12-1, 2-1);
    lcd_27.println("C    ");
   }
   digitalWrite(LED_BUILTIN, LOW);
   delay(1000);
}
```

Link from video: https://cutt.ly/7kujnZg

V. CONCLUSIONS

At present, robotics is a popular and effective method for studying important branches of science, design and is based on the active use of modern technologies in the production and everyday life.

The created device has the necessary stability in work and the reduced cost in comparison with analogs. Carrying out this development will allow to measure the temperature of the object and the environment, humidity, atmospheric pressure, as well as to carry out automated antiseptic spraying without contact with a person. The created device can be easily upgraded according to time requirements.

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The collection includes student works of the participants of the competition, which were not included in the number of prize-winners. The texts of the competitive works are published in the form in which they were submitted by the authors. The authors of the articles are responsible for the content and form of submission of the material.

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Odessa 2021