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Design and Implementation of a Contactless Infrared thermometer with Automatic Hand Sanitizer Dispenser using ATMEGA Microcontroller

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Abstract: *During these times, the Covid-19 pandemic has disrupted our way of life. There has been a need to come up with innovative ideas that can help combat its spread. As the disease is spread through human contacts and touching of surfaces. It is important to come up with ways that general hygiene can be more enhanced. One of the disease symptoms is the abnormally high temperature which has made it necessary for person temperatures to be taken at the entrances to malls, hospitals, schools etcetera in the effort to reduce the spread. In this line, our solution is an innovative way of detecting, reducing the spread, and minimizing contacts as much as possible. Our project is composed of two devices working in combination. Both devices will be designed and then implemented, then combined into a Contactless Infrared (IR) thermometer with hand sanitizer dispenser. The contactless IR thermometer uses MLX90614 to take the temperature readings and display them on OLED display. If the read temperature is within the normal range, the person can then place hand at and not touching the nozzle of the sanitizer dispenser which then dispenses automatically. If the person's temperature is above the normal, 37.5-degree celsius, the devices buzz a sound and give a Red indicator alert for further action to be taken. The two devices are controlled centrally using the ATMEGA 328p microcontroller.*

Keywords: Contactless thermometer, Hand sanitizer, Dispenser, Temperature sensor, Ultrasonic sensor, Infrared

1.0 INTRODUCTION

A contactless Infrared thermometer utilizes thermal radiations emitted by the body to give temperature readings [1]. An automatic dispenser uses modern technology to eliminate touching of the dispenser when washing hands or applying sanitizer. Infectious diseases can be passed from person to person by skin to skin contact, contamination of food, as well as touching of contaminated surfaces. It is therefore important to maintain high general hygiene such as washing of hands, general cleaning of our environment. Use of automatic hand sanitizer dispenser and contactless thermometer will go a long way in enhancing the hygiene [2]. The devices reduces contacts and as well touching of surfaces which could possibly be contaminated.

During this period that COVID-19 has affected the world, the World Health Organization (WHO) has given measures that help curb the spread of the disease [3]. Some of the recommended measures are regular and thorough cleaning of hands with an alcohol-based sanitizer or washing them with soap and water, reducing human interaction as much as possible, and maintaining at least 1 meter (3 feet) distance between persons and avoid touching of surfaces. Our devices will go a long way in ensuring the WHO prevention measures are met.

Schools, offices, and hospitals with contactless thermometer and touch-less hand sanitizer dispensers are miles ahead in the fight against COVID-19 disease. For operation, our device utilizes the advantage of the two devices to make easy to combat the spread of the disease. Ultrasonic sensor is set to detect object in the needed distance range. The details of the design are well elaborated in the next topic.

1.1 OBJECTIVES

1.1.0 Key objectives

- To design and implement a a Contactless IR thermometer with automatic hand sanitizer dispenser using ATMEGA Microcontroller

1.1.1 Other objectives

- To design a device that can alert when the temperatures are above normal.
- To design a system that allows one to sanitize after their temperatures are taken
- To design a system that ensures one have his temperature read and sanitized his hands before been allowed to enter

- To design a system that eliminated contact and touching of the surfaces

1.2 SYSTEM DESIGN

In the design, the Arduino nano microcontroller is powered using 12 V DC power adapter. The OLED display and the MLX 90614 IR sensor are powered from 3V Pin of the Arduino Board. The ultrasonic sensor is powered from the 5V Pin of the arduino Board. The 5v micro-submersible pump is powered by 5v through 7805 Dc regulator. The DC regulator lowers DC input voltage from 12V to 5 V. The Arduino is programmed to control the ultrasonic sensor and the submersible pump. The program has been edited in Arduino IDE environment. For the OLED display and MLX90614 sensor, Adafruit Libraries have been used [4].

When the person taking temperature places his face in the range 5 to 15 cm from the device, the Green LED blinks to indicate that temperature has been taken and the readings are displayed on the OLED display. If the taken temperature is within the normal range of 32 to 37.5 degree Celsius, it activates the dispenser but does not dispense until the person place hands in the of 0 to 10cm from the dispenser nozzle. If the read temperature is above 37.5 Degree Celsius, the device gives a buzzing sound and a Red LED blinking.

Components Required:

- MLX 90614 IR sensor
- OLED Display
- Ultrasonic Sensor
- 5V Mini DC submersible pump
- Toggle switch
- Red LED
- Blue LED
- 3 L container
- Hand Sanitizer
- Wires
- 7805 regulator
- Capacitors
- NPN Transistor
- Strip boards
- 4 sq mm pipe

Software used:

- Arduino IDE
- Proteus

1.3 CIRCUIT DIAGRAM

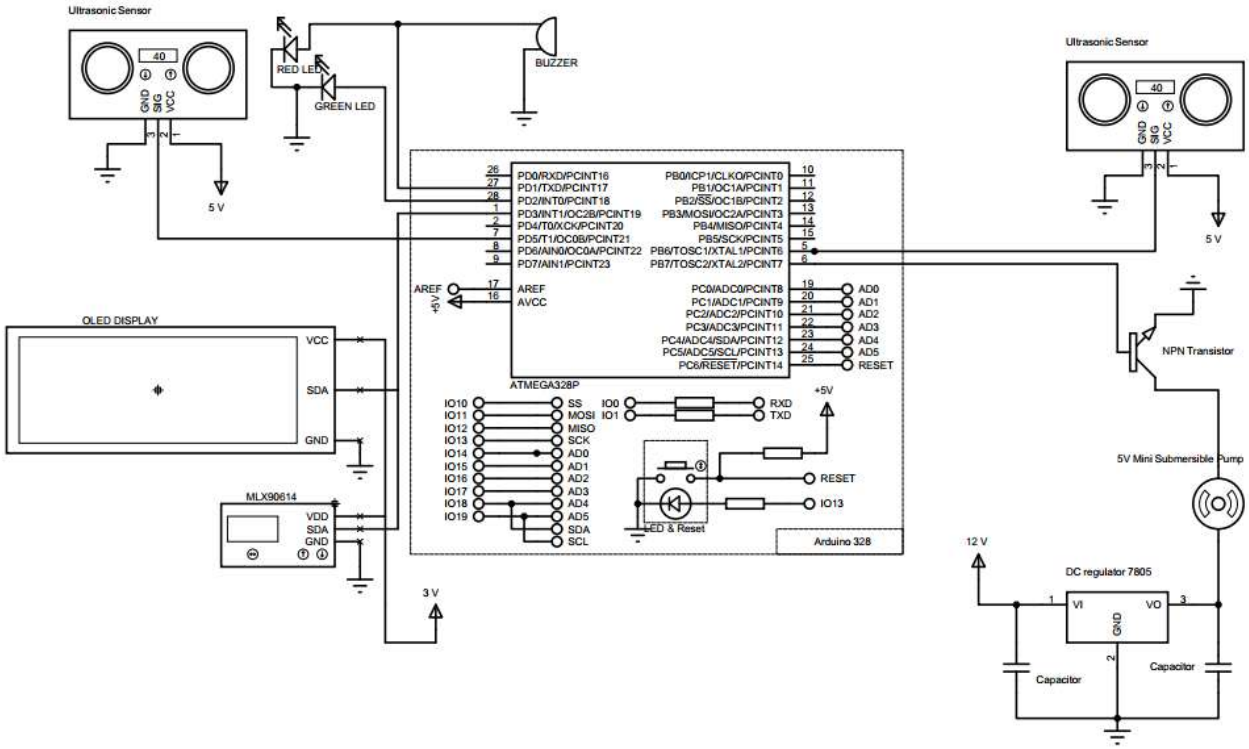

Figure 1: The circuit diagram of device

1.4 FLOWCHART

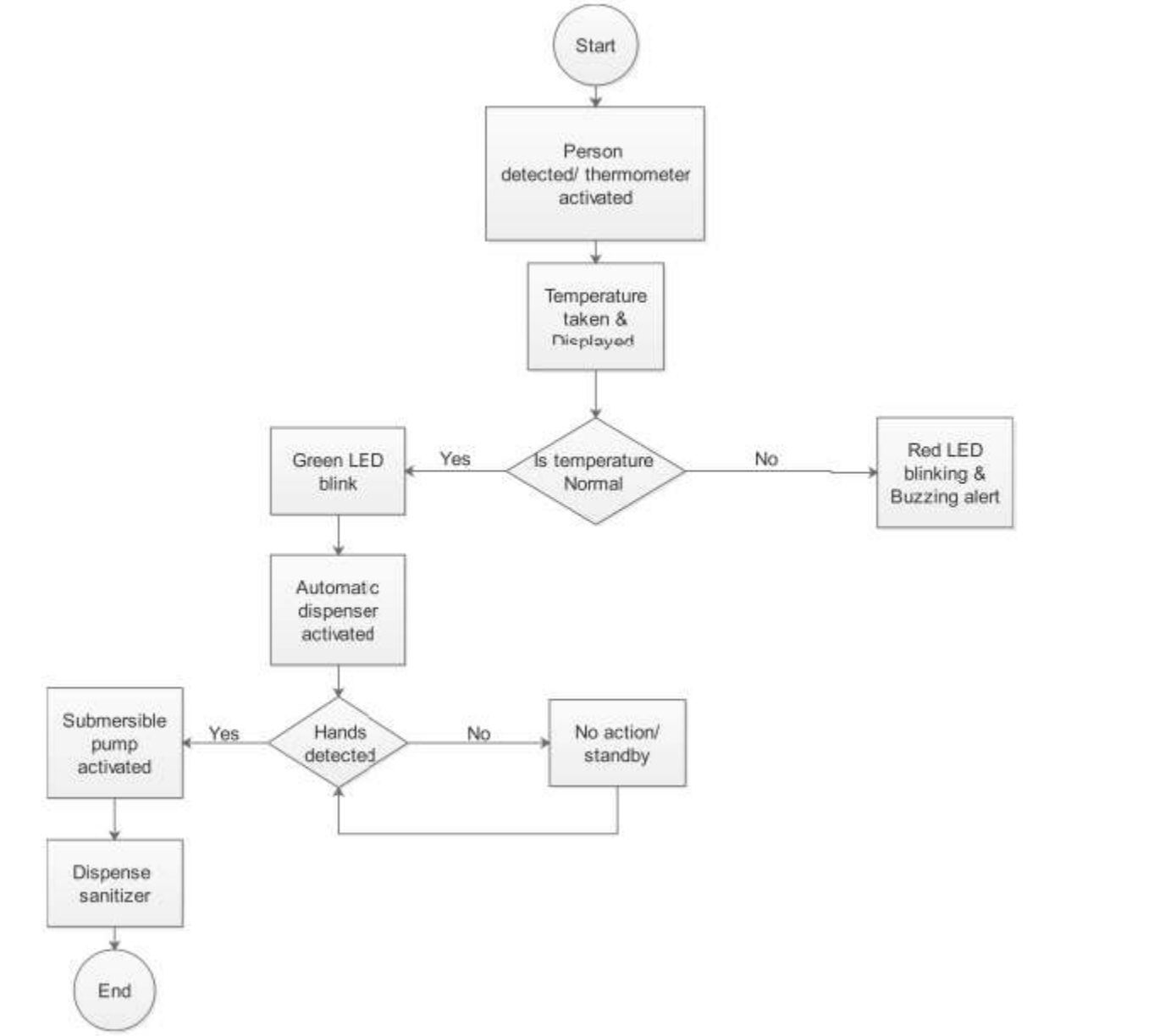

Figure 2: The device operation Flowchart

1.5 ARDUINO CODE

```
int distance;
float Time;
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, OLED_RESET); //Declaring the display name (display)
Adafruit_MLX90614 mlx = Adafruit_MLX90614();

void setup() {
  mlx.begin();
  display.begin(SSD1306_SWITCHCAPVCC, 0x3C); //Start the OLED display
  display.clearDisplay();
  display.display();
  Serial.begin(9600);
  pinMode(led1, OUTPUT);
  pinMode(led2, OUTPUT);
  pinMode(buzz, OUTPUT);
  pinMode(pump, OUTPUT);
  pinMode(trigg, OUTPUT); // Sets the trigPin as an OUTPUT
  pinMode(trigg2, OUTPUT);
  pinMode(echo, INPUT);
  pinMode(echo2, INPUT);

}

void loop() {

  /*float e = 0.95;
  mlx.writeEmissivity(e);*/
 //Serial.println(mlx.readEmissivity());
```

Figure 3: A Portion of Arduino Code used

1.6 TESTING AND RESULTS

After design and implementation, the device is tested for proper operation. The device takes the body temperature and display the readings on the OLED display. Once the readings are displayed, one can then place hands within the detection range to get the sanitizer. The sanitizer dispenser for a period of 2 sec and has allowance of 7 seconds after the temperature is taken and readings displayed. The device is therefore capable of serving large number of people. To casing for the design is made from Perspex sheet material which are joined using special Araldite glue. Below are the obtained results.

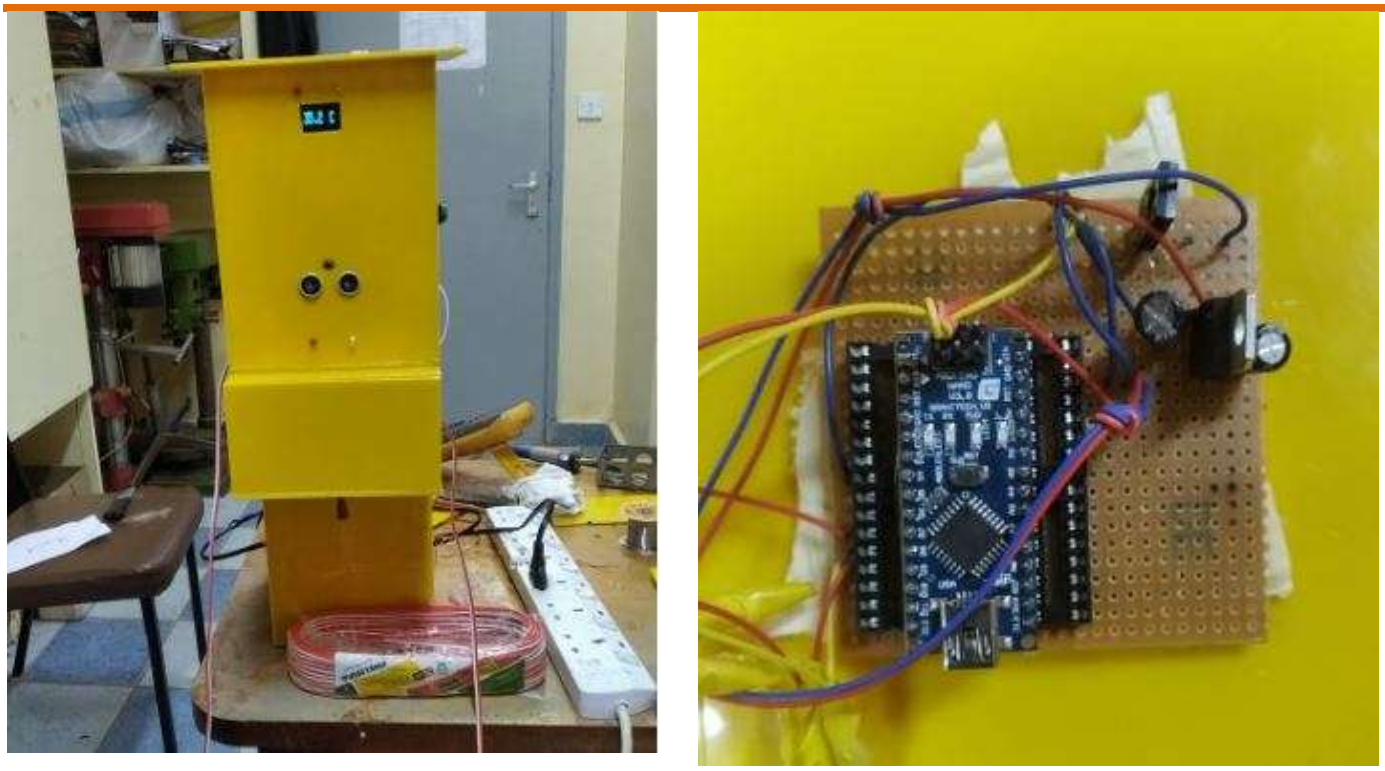

Figure 4: The completed system and the designed circuit

Figure 5: A working System

1.7 CONCLUSION

The device is a perfect example of how we can use technology to combat COVID-19 disease. The contactless and touch-less feature lowers chances of secondary cross infection and reduce the spread of the disease. It also gives an alerts when the person's body temperature is above normal so that necessary action can be taken. This reduces further spread from sick persons. The automatic hand sanitizer dispenser enhances hand Hygiene as recommended by WHO. An operational device can be installed at the entrances of schools, churches, malls, offices etc. The system has been properly designed and implemented and the objectives of the project are therefore successfully achieved.

1.8 REFERENCES

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