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Smart Digital Thermometer for Covid-19 Detection

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Abstract
During the COVID-19 epidemic, taking temperatures has been a major focus. The aim of this project is to implement a prototype of a cheap and high reliability digital temperature measurement device with the aid of Arduino Nano, Infrared temperature sensor (MXL90614), OLED 128 X 64 (0.96-inch screen size), IR sensor and buzzer. This thermometer uses an infrared sensor MXL90614 to detect the body temperature and then sends the reading to the microcontroller. If there is no human presence near the system, it will read zero; however, if there is, it will measure the temperature of the person through their hand or whichever portion is utilized as a point of contact closer to the system and communicate the reading. After that, the reading is presented on the OLED screen. The prototype's design and implementation were completed, and the desired outcome was obtained.

Keywords: *digital temperature, Arduino Nano, Infrared temperature sensor, Smart digital thermometer, OLED*

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I. Introduction

Previously, temperature was measured with an analogue metre, technology has recently transitioned from analogue to digital [1]. Resistance temperature detectors (RTDs), thermocouple, thermistor, contact, and remote are some of the numerous types of digital thermometers available [7]. Temperature measurement is important in the medical field [2] because it allows doctors to gather a wealth of information about an individual's health. As a result of the ongoing spread of novel Corona Virus Disease (COVID-19) in Nigeria, according to the most recent statistics from the Nigeria Centre for Disease Control, the country now has 254,137 confirmed cases [13]. On February 16, 2022, 13 new confirmed cases of the covid-19 were recorded in Nigeria, with no deaths; therefore, a high reliability thermometer for measuring the body temperature at a specific time is required for a good guarantee of the citizen's daily life. The traditional mercury thermometers require human body contact and longer measurement hence the need for this project. This gap can be bridged by infrared (IR) thermometers, which detect the amount of thermal or black-body radiation emitted by the object without requiring direct contact [3]. An infrared thermometer can measure temperature without making direct contact, which can aid in the spread of a contact infection [5]. The temperature sensor is utilized in the system to collect the temperature [8]. The average human body temperature is 36.5-37.5°C, though this varies depending on the time of day and how it is measured [4]. According to current health guidelines, anyone with a temperature of 37.8°C or higher should be considered potentially infected with COVID-19 and should self-isolate [4]. Hence, this work is intended to provide [15] high-reliability digital temperature measurement device.

II. Materials and Methods

This section consists of the procedures, techniques and methods used in carrying out the set objectives of the project. The high reliability digital thermometer system is made up of two important subsystems, which are the hardware subsystem and the software subsystem[14]. The hardware subsystem consist of Arduino Nano, Infrared temperature sensor(MXL90614), OLED 128 X 64 (0.96 inches in screen size) , IR sensor and buzzer. The system was programmed with Arduino IDE.

The Arduino Nano is simply a scaled-down version of the Arduino UNO. It has a 5V operating voltage, but the input voltage can range from 7 to 12V [6]. The MLX90614 is an infrared thermometer that measures temperature without touching it [9]. The OLED display module is small, with a diagonal of only 0.96" and

128x64 individual yellow and blue OLED pixels that are individually turned on or off by the controller chip [10]. A buzzer is a voice device that transforms an audio model into a sound signal [12]. The buzzer in the thermometer mainly plays the role of beep. Because the thermometer is relatively small, the buzzer we use must also be smaller [11]. The no contact thermometer uses a battery, and the required working voltage is relatively low, generally 3V [11].

Whenever the IR sensor with range between1-5cm detect an object at that particular range the IR sensor send high signal to microcontroller. Whenever the microcontroller receives a high signal from IR sensor then trigger the temperature sensor to measure the temperature of that particular object placed in front of IR sensor and send the reading to microcontroller. The sensor can measure two types of temperature the ambient temperature and object temperature. In this project the concern is object temperature, whenever IR sensors is high it trigger the infrared sensor to measure object temperature and send the signal to microcontroller. Microcontroller receives the signal and then display that on the OLED screen.

III. Design and implementation

Before implementing the circuit on a Vero board, the components were tested to confirm their rated values. The components were carefully soldered to avoid damage. Short circuits and continuity test were then carried out on the circuit board.

The connections diagram and the system snap during implementation are shown in Figs. 3.1 and 3.2, respectively.

Fig. 3.1: Connections diagram of circuit components

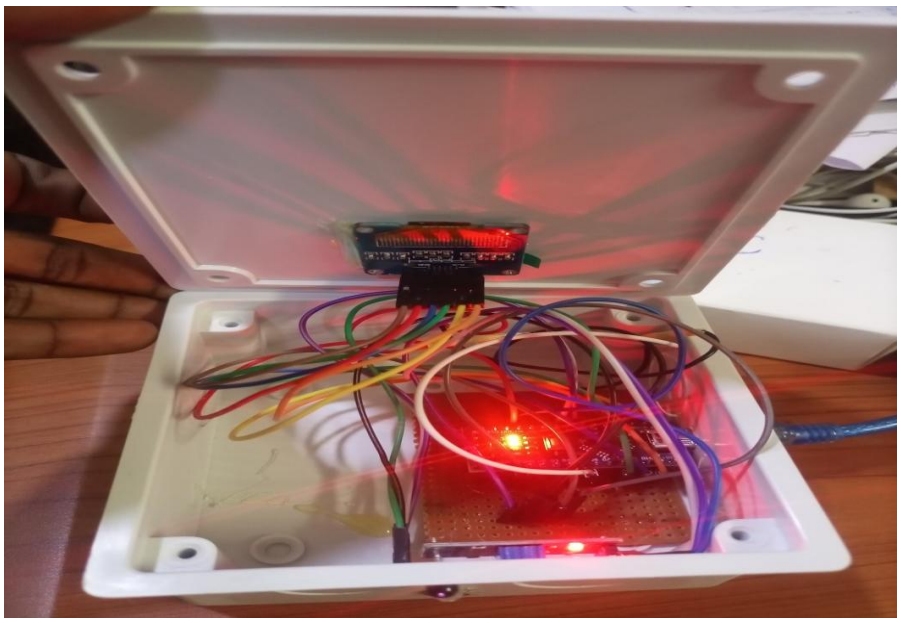

Fig. 3.2: System snap shot during implementation

A. Flow Chart of the system

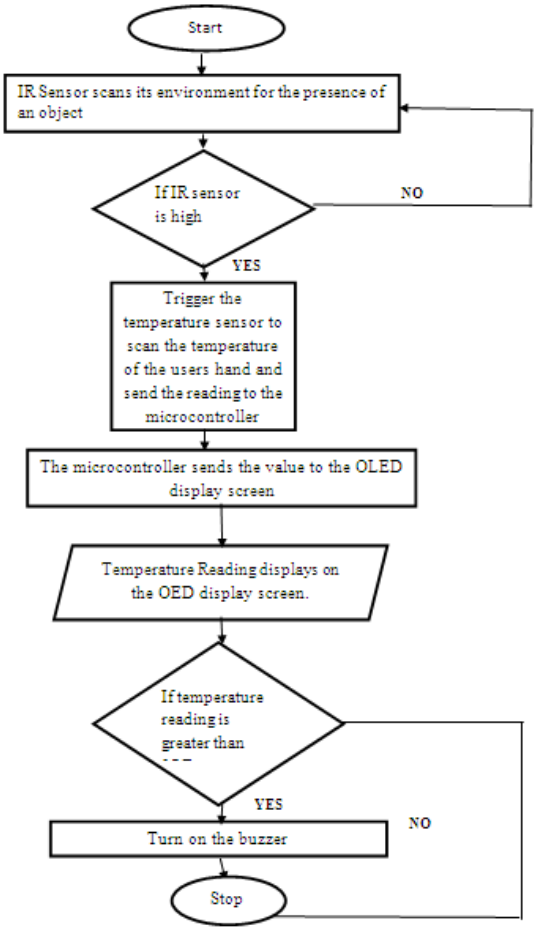

Figure 3.3: The flowchart illustrating how the system works

4. Testing

The implementation system was placed in a way that no object is seen and OLED screen displays place your hand

Fig:4.1 : The implementation system was placed in a way that no object is seen and OLED screen

Fig:4.2: After placement of fore head the temperature then display on the screen

Fig. 4.3: Temperature monitor initializing

A COVID19 patient can then be predicted if the temperature exceeds 37.8°C by buzzer beeping for 5 seconds. According to current health guidelines, anyone with a temperature of 37.8°C or higher should be considered potentially infected with COVID-19 and should self-isolate [4].

IV. Conclusion

The objective of this project has been the design and development of a smart digital thermometer for covid-19 detection.The design enables for dynamic use in any field where temperature is measured. All Nigerian tertiary institutions are encouraged to use it as a screening tool to see if a student has a high temperature that could be caused by a COVID-19 infection.

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