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Patient Temparature Monitoring System

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Abstract. *Our project is a working model which incorporates sensor to measure parameters like body temperature. An Arduino nano board is used for analyzing the inputs from the patient and any abnormality felt by the patient causes the monitoring system to give an alarm. Also, all the process parameters within an interval selectable by the user are recorded. This is very useful for future analysis review of patient's health condition. For more versatile medical applications, this project can be improvised, by incorporating blood pressure monitoring systems, ECG, dental sensors and annunciation systems, thereby making it useful in hospitals as a very efficient and dedicated patient care system. Fever is a common symptom of many infections, e.g., in the ongoing COVID-19 pandemic, keeping monitoring devices such as thermometers in constant demand. Recent technological advancements have made infrared (IR) thermometers the choice for contactless screening of multiple individuals. Yet, even so, the measurement accuracy of such thermometers is affected by many factors including the distance from the volunteers' forehead, impurities (such as sweat), and the location measured on the volunteers' forehead. To overcome these factors, we describe the assembly of an Arduino-based digital IR thermometer with distance correction using the MLX90614 IR thermometer and HC-SR04 ultrasonic sensors. Coupled with some analysis of these factors, we also found ways to program compensation methods for the final assembled digital IR thermometer to provide more accurate readings and measurements*

1. INTRODUCTION

A Thermos sensor is used for the measurement of body temperature and respiratory temperature. This thermos sensor is a passive transducer, and its resistance depends on the beat being applied on it. We have arranged the sensor in the potential divider circuit. This sensor exhibits a large change in resistance with a change in body temperature. The respiratory rate is determined by holding the sensor near the nose. The temperature sensor part is attached to the patient whose temperature must be measured, which changes the values and thus the corresponding change in the temperature is displayed on the monitor graphically. Also, all temperature measurements are updated in the patient's database. Here in our project, we use bead temperature sensor. Early methods of measuring body core temperature utilizing contact mercury thermometers are replaced by the safer and more convenient electronic thermometers at the sublingual, armpits, ear canals, and in some rare occasions, the rectum and axillary for accuracy. Many of these surface measurement sites, specifically the temporal and central forehead, reflect lower readings than internal sites such as the tympanic temperature readings, the current gold standard to represent the body core temperature, especially given the impracticality of rectal/anal temperature takings. While screening for disease in the ongoing pandemic, rapid temperature measurements of many individuals quickly and safely without allowing the thermometer to be a vector of pathogen transfer are crucial, thus making contact infeasible, ruling out many of the above measurement sites. Infrared (IR) thermometers can fill this gap by measuring the surface temperature without direct contact, which is through detecting the amount of thermal or black-body radiation emitted by the object. Additionally, these thermometers are now commonly used in clinical practices, as well as routinely during the pandemic for self-monitoring and screening at the entrances of public places. Typically, IR thermometer casings are manufactured by expensive injection molding (due to mold production and tooling costs), producing significant waste material. The increased adoption of three-dimensional (3D) printing technology has revolutionized prototyping and reduced cost by shortening the lead time to manufacture with significantly less waste. Coupling with 3D printing, the use of 'off-the-shelf' microcontroller kits such as Arduino, Raspberry Pi, and Micro: bit can now allow novel electronic products to be cost-effectively assembled, even by non-engineers without specialized equipment. It is with such enabling technology that even home-made measurement devices can be made easily, e.g., spectrophotometers, including those for psychological research use. While thermometers can be easily assembled, IR thermometers are often thought to be less reliable than traditional contact thermometers. Non-contract infrared thermometers were previously reported to have a sensitivity between 4.0% to 89.6%, specificity between 75.4% to 99.6%, and a positive predictive value between 0.9% to 76.0%. In fact, there are recommendations for its repeated measurements at hospital gantries, given that IR thermometers are highly prone to external interferences by surrounding temperatures, relative humidity, the site of measurement, and the presence of oil (sebum) and sweat on the forehead, as well as other factors in the immediate environment. Apart from these innate factors, intrinsic human physiological factors such as fever or exercise can produce sweat to affect the measurements.

2. PROPOSED METHOD

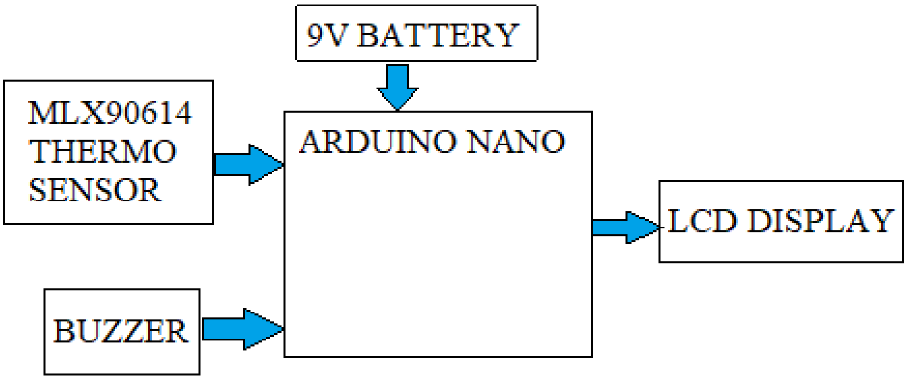

FIGURE 1. Block diagram of Proposed method

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-B mini-USB cable or from a 9 V battery. LCD stands for Liquid Crystal Display. 16×2 LCD is named so because; it has 16 Columns and 2 Rows.16*2 LCD are alphanumeric LCD's which can display alphabets, numbers and some special characters. They are easily operate using commands which hexadecimal values. There are a lot of combinations available like 8×1, 8×2, 10×2, 16×1, etc. But the most used one is the 16×2 LCD. So, it will have 16×2 = 32 characters in total and each character will be made of 5×8 Pixel Dots. The MLX90614 is an infrared thermometer for non-contact temperature measurements. Both the IR sensitive thermopile detector chip and the signal conditioning ASIC are integrated in the same TO-39 can. A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke.

3. CIRCUIT DIAGRAM

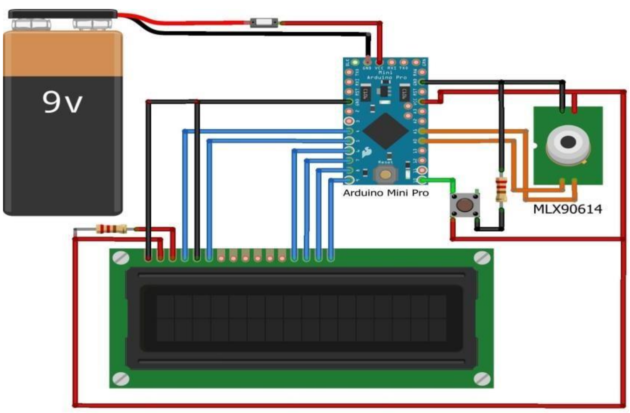

FIGURE 2. Circuit Diagram of Proposed method

The Circuit diagram for making a Non-Contact Infrared Thermometer using MLX90614 sensor, Arduino Nano, LCD display and battery is given below.The circuit has Arduino Nano which is used because of the small and compact size. The Arduino Pro Mini Board has 2 versions, one of them works at 5V, 16MHz, and the other at 3.3V, 8 MHz You can select 3.3V, 8MHz Arduino Pro Mini as you are powering the device using a 3.7V Lithium-Ion Battery. The RAW pin of Arduino pro-Mini is directly connected to the battery VCC Pin via a push switch. To point the object, you can use Laser Diode Breakout Board. Laser Diode Module is a low-cost module with a wavelength of 650nm and an operating voltage of 3V-5V. The laser head is composed of a light-emitting tube, condenser lens, and adjustable copper sleeve. It can work directly after connecting to a dc power supply. In our circuit, we connect the Laser Diode output pin to the D12 of Arduino Pro Mini.

4. WORKING PRINCIPLE

Using ARDUINO and buzzer, it is possible to alert the healthcare staff. First the thermos sensor used in circuit measures the temperature of the patient body to which it is pointed. The collected data is sent to the Arduino nano processor. The processor checks the reads the input data and produces the output. If the input temperature is more than 100F then the buzzer produces auditory beeps. For the buzzer to produce auditory beeps, the Arduino is programmed in such a way that it reads input and compares then produces the output. Irrespective of the input temperature detected, the detected temperature is displayed on the 16*2 LCD display so that the monitoring person also knows the exact temperature of the body. All the data transmissions from the input to output devices are made possible using Arduino nano.

5. RESULT ANALYSIS

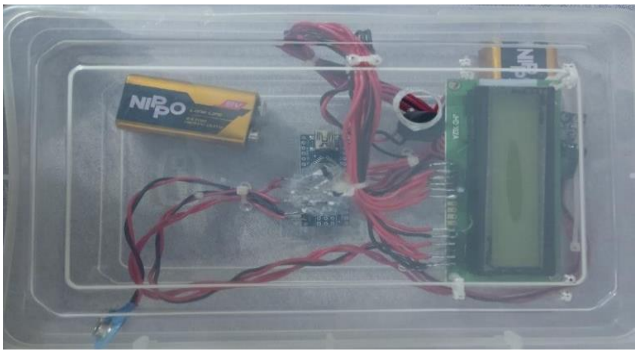

FIGURE 3. Proposes system

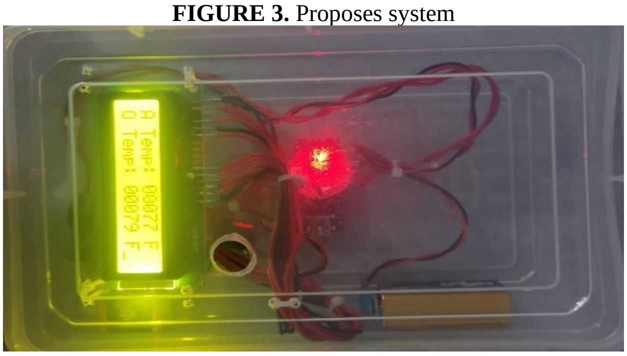

FIGURE 4. Output of system

6. CONCLUSION

In this paper, the infrared temperature measurement module for the measurement of body temperature, the measurement of the traditional contact thermometer is avoided, it is particularly suitable for measuring body temperature for infants and young children. The measured temperature is displayed through the LCD module, and it has the function of voice broadcast, it can be used by the man of poor eyesight. Non - contact measurement, measuring speed is quick, thbody temperature is measured in the larger flow of people (such as stations, terminals, etc.) Forehead temperature measurements using an IR thermometer play an important role of rapid screening for fever to identify the infected individual. The performance and precision of an IR thermometer for forehead temperature screening were studied together with the design and implementation of an improved infrared temperature sensor-based system with distance sensing capabilities.

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