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Automated Sanitizer & Temperature Anomaly Detector

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Abstract:- **Hand sanitizers are usually applied by pressing the sanitizer dispenser cap with hands, causing many people to come into contact with the dispenser cap surface, which increases the probability of getting infected. As per the recommendation and advisory given by WHO and medical fraternity, vigorous sanitization is needed for protection from this virus. The presented module provides the solution for this issue by introducing an innovative automatic hand sanitizer-cum- temperature sensing system, which can perform sanitization and detect temperature simultaneously whenever desired, without any contact with the machine, thus eradicating the possibility of getting infected from the manual usage of sanitizer dispenser. The paper discusses briefly about the different sensors being used in the module, namely PIR Sensor, MLX90614(temperature sensor) and HC-SR04(ultrasonic distance sensor).**

Keywords:- *Automatic hand sanitizer, Arduino, ultrasonic sensor, PIR sensor, MLX90614, Ultrasonic Distance Sensor (HC-SR04), covid-19.*

I. INTRODUCTION

Since December 2019 the world has been under tremendous tension, as the number of infected are increasing day by day, and till date no vaccine has proved perfect against the pandemic agent, Corona Virus. The weaker section of the society is facing the hardship due to vigorous lockdown across the nations. The demand for hand sanitizers has seen a significant rise as the coronavirus spread across the globe. Alcohol based hand sanitizers are used by pressing the sanitizer cap with hands. This causes people to touch the cap surface, which increases the infection chances. Pressing the pump handle is a manual process, and many pass-by without disinfecting themselves. Furthermore, each person presses the cap differently, which makes it difficult for predicting the amount of use and manage the timings of replacing or refilling. Sanitization has been one of the fundamental pillars of combat and is the most efficient method along with use of face masks to prevent the escalation of Covid-19 virus. Most modern methods of sanitization are relying on foot operated sanitizers and sanitizer dispensers for this purpose. However, the majority of these are not contactless, which defeats the purpose of sanitizing multiple people [1].

Due to this, the true use of hand sanitizers is drastically reduced, which does not aid in preventing the spread of Covid-19. To counter this problem, in this research work, an automatic hand sanitizer with temperature sensing design prototype has been made [2].

II. LITERATURE REVIEW

The rapid increase of the Corona Virus has alarmed the global medial community and has caused complications for everybody and everywhere. Better hand hygiene is one of the initial crucial steps to prevent this spread. But the lack of automated systems which can monitor hand hygiene compliance and analysis of the collected data, some hospitals resort to direct observations, reports, surveys, sanitizer dispenser usage and other such methods to monitor the regulatory affairs of the healthcare providers[3].

Recent advances in vaccinations offered the possibility that Corona virus might soon be a thing of the past, but the current situation indicates something else. In the past several decades, the global community has slowly come to realize the impact of such viral diseases and the need for an approach to combat it. In this paper, we attempt to reduce the impact of such diseases by involving healthy hygiene habits to contain these viruses (Sars-Covid) in the home and community [4].

The pandemic crisis can be further tackled by using non- contact thermometer for early detection of coronavirus by rapidly discovering people suffering from mild to moderate fever. Non- contact sensors like the MLX can be used to remotely measure the core body temperature within a few seconds, and within a distance of few inches away from the body [5].

III. OBJECTIVES

The project's objective is to develop a device that can automate the process of hand sanitizing by making it perfectly contactless, as well as measure the temperature of the subject, and detect anomalies, if any. The design has been done for easy installation of the hardware in every possible place across the globe. The design of the prototype aims to reduce the total surface area which will be covered by the module and give the maximum efficiency possible.

Committing to the need of the hour, the project serves two essential functions. One of it is to sanitize people and the adjacent atmosphere. Another aim is to detect the temperature of the people that are entering in the range of the device. This is done with the help of the non-contact MLX sensor.

The objectives of the project are to make use of the different sensors to develop a working module using their

parameters, which include:
(a) Installing temperature sensor,
(b) A LCD for displaying temperature, spray pumps,
(c) Ultrasonic sensor and PIR sensor and using Arduino Uno R3 to synchronize the various sensors used.

Various components used are enlisted in table 1:

Table 1: COMPONENTS FOR HARDWARE

S. NO.	PARAMETERS	Qt.
1	**Arduino Uno R3**	1
2	**Ultrasonic Range Finder**	1
3	**DC motor/Submersible Spray Pump**	2
4	**LCD 16x2**	1
5	**250 kilo Ohm Potentiometer**	1
6	**220-ohm resistors**	1
7	**Temperature Sensor**	1
8	**LED RGB**	1
9	**Piezo Buzzer**	1
10	**Bread Board**	2
11	**PIR Sensor**	1

Process flowchart for hardware sanitizer system used is shown in figure 1.

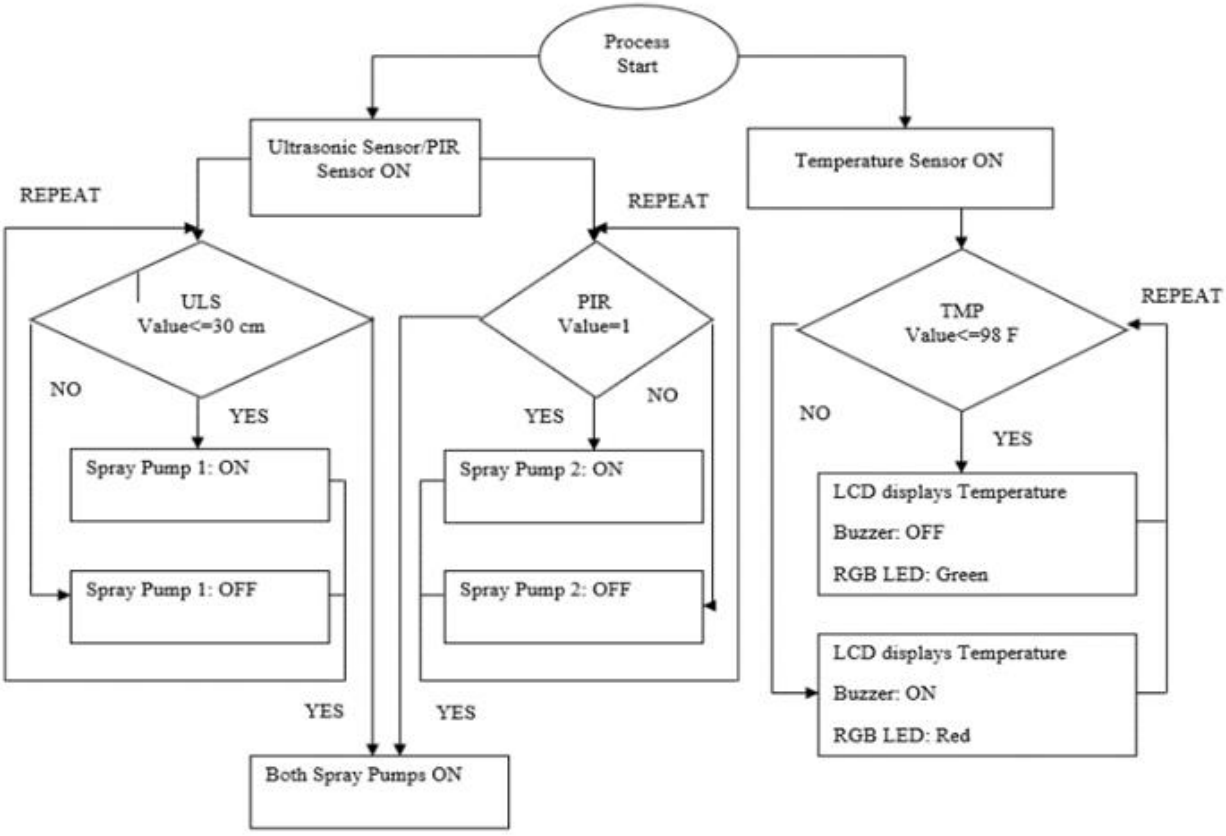

Figure 1 : Process Flowchart

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The device prototype model is shown in figure 2 as follows :

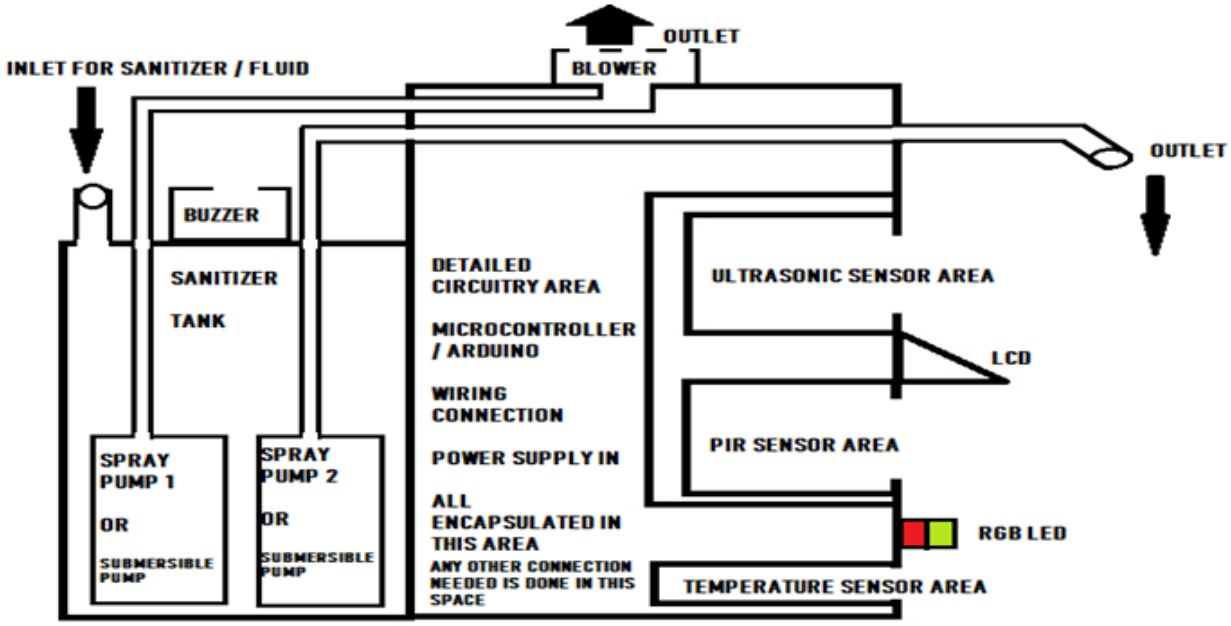


Figure 2 : prototype model

IV. OPERATIONAL WORKING

As we switch on the device, the sensors attached to the Arduino gets activated. We have two systems to work simultaneously to each other. First the automatic sanitizer and secondly the temperature sensing. The ultrasonic sensor and PIR sensor are attached to the Arduino for detection of human/object ranging and motion respectively. In this module, Arduino acts as the main controller to survey the functioning and overall process. The hand is detected by the IR Sensor, ad a signal response is sent to the microcontroller and in response, the hand gets sanitized [6].

The PIR sensor has an immediate range of up to 12 meters to 15 meters and anything that is detected within the specified range by the sensor will activate the sanitizer; and the surrounding will get sanitized by Spray pump 1. A fan or blower can be used to spray the sanitizer liquid in the surrounding areas. For detection of hands in the immediate vicinity, an ultrasonic sensor is used. The ultrasonic sensor detects within a 30 cm range and if anything is discovered within the specified range, Spray pump number 2 will get activated and the user will be sanitized via an inlet. The sanitization is done simultaneously with the activation of the sensors, keeping the particular region sanitized and free from virus, bacteria or any other infectious agent.

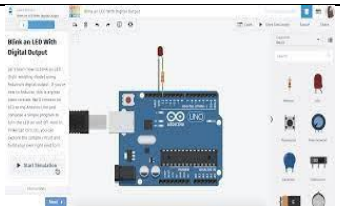
The temperature sensor senses the body temperature of the person as soon as it detects presence(8cm-10cm) and displays the temperature in Fahrenheit in the LCD display. The LCD can be programmed to display temperature in Celsius as well. If the temperature sensed is above the normal body temperature(98.6 Fahrenheit) the buzzer sounds an alarm and the RGB led attached turns red, if the sensed value of the sensor is equal or below 98.6 Fahrenheit then the buzzer remains off and the RGB led turns green, depicting absence of fever in the person.

Component Description:

For developing a working prototype, several types of sensors were used. Ultrasonic sensors were used to calculate the relative distance between the hands and the device. MLX sensor was used to measure the temperature of the subject without any contact between the device and the subject itself.

Arduino Uno served as the primary microcontroller to process all the required data and activate the spray pumps which further sanitized the adjacent atmosphere. An LCD screen is also used which displays the temperature measured by the sensor. It gives a visual representation of the collected data; As shown in table2.

Table 2 : components description used in table 2

S.no	Component's Description	Figures
1	**Arduino UNO (R3):** It is an open-source microcontroller board and is used for programming and synchronizing of different types of sensors. The different sets of pins for analog and digital input/output allows it to be interfaced with various types of circuits as shown in figure 3. (Louis, April,2016).	 Figure 3 : **Arduino UNO (R3)**
2	**Ultrasonic Range Finder (HC-SR04)***:* Ultrasonic transducers and sensors are devices that can generate or sense ultrasonic energy and can be broadly divided into transmitters, receivers and trans receivers. **Figure 4** shows an **Ultrasonic Range Finder** (HC-SR04).	 Figure 4 : **Ultrasonic Range Finder (HC-SR04)**
3	**LCD 16 × 2 :** LCD is a flat panel display which uses light modulating properties of liquid crystals . (How 16×2 LCDs work | Build a basic 16×2 character LCD, 2016)..A potentiometer is also utilized here which is used to continue the contrasting of display screen. **Figure 5** shows an **LCD 16 × 2.**	 Figure 5 : LCD 16 * 2
4	**Temperature Sensor [MLX90614]:** The temperature sensor is used to record the temperature of environment and then process the input into electrical data. (**Figure 6). MLX sensor** was used because of its ability to measure the temperature without any contact.	 Figure 6 : **Temperature Sensor [MLX90614]**
5	**PIR Sensor***:* Passive Infrared Sensors are used to sense motion and it almost detects human motion. The sensor is built using a pyroelectric sensor, it detects infrared signals, as every living body emits some level of radiation. **Figure 7** shows a **PIR sensor**.	 Figure 7 **PIR Sensor**
6	**TINKERCAD Software:** The circuit is designed in TINKERCAD software, programming is done, simulated and made to a working schematic. Relays can be attached to drive the motors/pumps attached in circuitry.	 Figure 8 TINKERCAD Software

V. RESULT AND DISCUSSION

Simulating the circuit at different instance we can see the working of two motors, as there is a change of rpm in the motors while changing the sensor values. Checking for the led and buzzer signal while sensing temperature it can be seen in Figure 8 that led changes its colour and there is a radiating wave signal/tone through the buzzer.

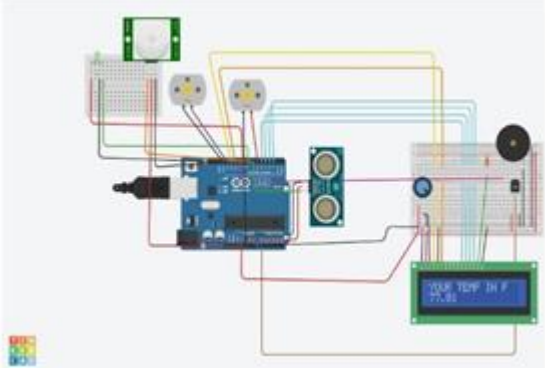


Figure 8: Shows the led is green and buzzer is off as temperature is 77.01 □ F (< 98.6□ F).

As shown in subsequent figure, the Led turns red or green depending upon the temperature measured by the sensors and the buzzer produces a sound which will alert nearby authorities if the temperature is high.

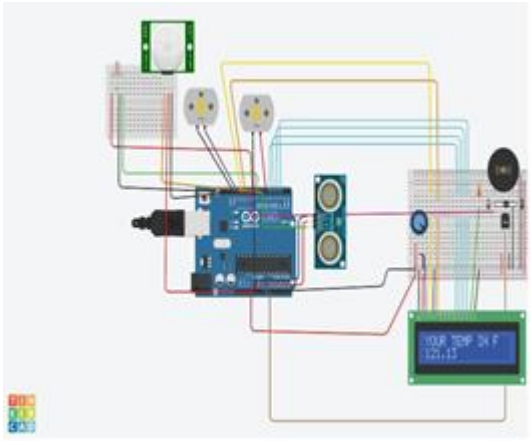


Figure 9: Shows the led turn red and buzzer produces

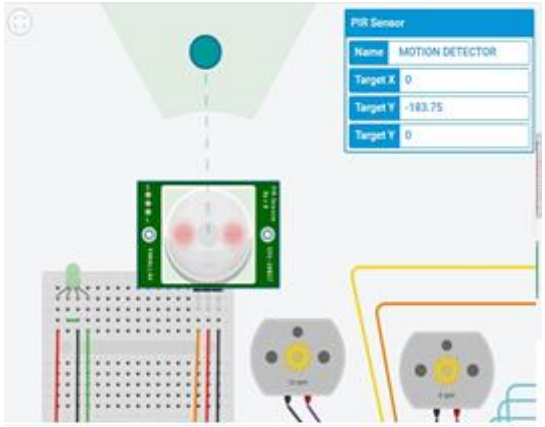


Figure 10: Shows that spray pump/motor 1 runs with certain rpm as the PIR sensor gets activated.

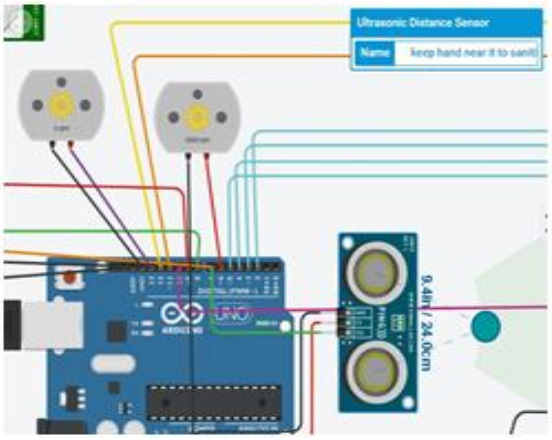


Figure 11: Shows that spray pump/motor 2 runs with certain rpm as the Ultrasonic sensor gets activated. **Wave signal/tone as temperature changes to 121**.3□ F (< 98.6□ F).

VI. HARDWARE SIMULATIONS

As shown in figure 12, the LCD will display temperature of surrounding areas with LED indicating it.

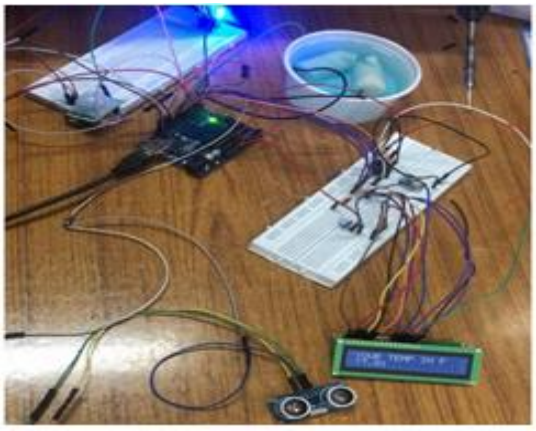


Figure12: The LCD displays the ambient temperature and LED glows blue, indicating normal temperature

As shown in figure 13, the LCD will display temperature of adjacent item and LED will glow accordingly.

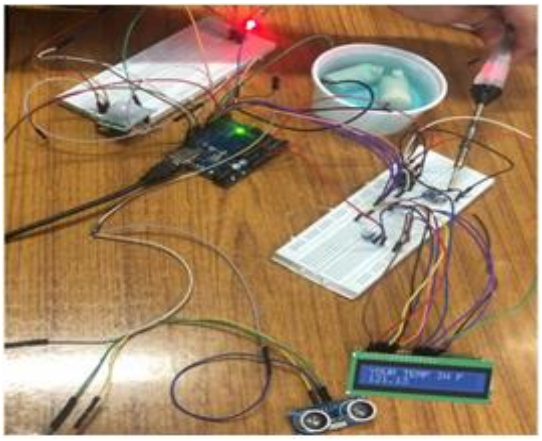


Figure 13: The LCD displays the temperature of object(solder) and LED glows red, indicating higher threshold temperature accompanied by buzzer sound.

VII. CONCLUSION AND FUTURE SCOPE

The device circuit was made using TINKERCAD software and the simulation were used to develop a prototype model accordingly. The dispensation of power to individual modules in the circuit can be affected, but this issue can be easily sorted by making use of relays which will provide the necessary power distribution from the microcontroller to the more sensitive modules like LCD, different sensors. The device can be developed and assembled easily. The cost of the module is relatively low, and its installation can be done in all tye of areas, be it educational institutes, workplaces, hospitals, shops and houses. The proposed project aims to eradicate further outbreak by isolating and sanitizing on any infected surface and /or person. To draw line of conclusion f project, it can be said that this project is an effective weapon in the war against this deadly virus.

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