International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 06 | June - 2021 ISSN: 2582-3930

Automatic Hand Sanitizer Dispenser and Temperature Detection Module

Mr.A.H.Ansari[1], Snehal Wakchaure[2], Pratiksha More[3], Tejaswini Shinde[4]

[1]*Prof. Dept. of Electronics and Telecommunication Engineering, Pravara Rural Engineering College, Loni, India*

[2,3,4] *Students, Dept. of Electronics and Telecommunication Engineering, Pravara Rural Engineering College, Loni,India*

Abstract - In this covid-19 pandemic period which is a global outbreak, hand hygiene is the core preventive measure in the spread of the disease as advised by WHO (World Health Organization) which includes washing hands with water and soap regularly, hand sanitizing using hand sanitizers, etc. Viruses such as COVID-19 are transferrable through touch and contact. There are WHO guidelines to clean or sanitize hands regularly to reduce the risk of infection. Dispensing of sanitizer from bottle and storage would require manual intervention. In this paper we propose a novel design of touch-less sanitizer machine to reduce the risk due to contact. The design and development of a non-contact temperature reader and sanitizer dispenser (NTRSD) system is presented in this study. The system is intended to help prevent the spread of SARS-CoV-2 infection and assist in maintaining and/or improving community health and reducing the negative impact of the infection on the economy and society. The NTRSD has two subsystems, the temperature reader (TR) and the sanitizer dispenser (SD), which is controlled from a common microcontroller and by design, cannot operate simultaneously. The TR is designed and developed to perform comparably in terms of accuracy with existing and commercially handheld infrared thermometers, display to the user the temperature read, and give visual and aural alerts when the temperature read exceeds the critical body temperature of 38 degrees centigrade. The SD is designed and developed to deliver sanitizer economically, by dispensing only once and only at a needed amount when activated.

Key Words: Hand Sanitizer, Ultrasonic Sensor, Contactless Thermometer, Spray Motor, Arduino.

1. INTRODUCTION

Demand for hand sanitizers has surged as the coronavirus broke out and spread around the world. Alcohol gel hand sanitizers are usually applied by squirting the sanitizer liquid when one presses a pump with one's hand. This causes many people to come into contact with the pump handle, which increases the risk of viral transmission. Pressing the pump handle is bothersome, and many pass by without disinfecting their hands. Moreover, each person presses the pump handle differently, making it difficult to predict the amount of use and to manage refills and replacements. For this reason, the actual use of hand sanitizers is reduced, which does not help prevent spread of the virus. Hands are considered to be the primary mode of infectious diseases, especially for those living in close proximity such as college residence halls, shopping malls, bank halls, market areas etc. Because of the frequent contact with hands and multiple surfaces, the incidence of cross-contamination is significantly increased. Hand hygiene is a major requirement for human health and many infectious diseases can be emerged if proper hand hygiene procedures are not implemented. Hand washing is the simplest, important and cost effective way to improve hand hygiene in health care and support the prevention of infectious disease.

Over recent years, there has been increasing availability and usage of hand sanitizing products. The main advantage of these products seems to be that they are more trusted, quicker and easier to use. They may also provide another way to clean the hands when water and soap are not available. Using hand sanitizers is usually considered to be an effective hand hygiene regime for hospital, health-care settings and others. As we all know, the COVID-19 outbreak hit the world and changed our lifestyle. In this condition, Alcohol and hand sanitizers are vital fluids; however, they must be used properly. Touching alcohol containers or hand sanitizers with infected hands can spread the virus to the next person. In this research paper, we will design and implement a smart hand sanitizer dispenser that uses ultrasonic sensor to detect the presence of a hand, activates the first servo motor to pour the liquid on the hand, The system utilizes a single Arduino Uno, an MLX90614 temperature sensor, two ultrasonic sensors, an LCD, two pilot lights, a buzzer, a submersible sanitizer pump, an alcohol reservoir, a power supply and a frame to house the system. by using infrared thermometer. Melexis's MLX90614ESF-BAA is an infrared thermometer designed for noncontact temperature sensing. An internal 17-bit ADC and a powerful DSP contribute to the MLX90614's high accuracy and resolution. It has a huge number of applications including body temperature measurement and movement detection.

1.2. LITERATURE REVIEW

In [1], the paper mainly says about the hospital grasped infections, which is about 2 Million Patients per year and also says that it is 8th leading cause for deaths annually in USA. It also says that hand washing is important and also effective with proper hand washing steps, but washing with soap and water is time consuming for peak hours in hospitals. This paper also showed the effectiveness of the alcohol based hand sanitizers, which reduced infection rates by whopping 30%. They used hand sanitizers with 60 to 70 percent ethanol or isopropanol for reducing significant number of pathogens. The patients were also given about 4.25 ounce containers of hand sanitizer alongside their beds. For 10 month period of using hand sanitizers showed a result of 36.1% infection reduction.

In [2], the paper says about the infection caused by drug resistant micro-organisms which causes increase in death rate and also complications, the multidrug resistant bacteria includes Methicillin Resistant Staphylococcus aurous(MRSA), Extended Spectrum Beta-lactamase (ESBL) producing bacteria, Multidrug Resistant Pseudomonas aeruginosa(MDRP), which are very common worldwide. Several antibiotics have increasing multidrug bacteria isolation rate, even personal protection equipment (PPE) can't be effective in isolation rate of MSR
A. Hence they emphasize about the use of alcohol based hand sanitizers since the alcohol based hand sanitizers had negative association with MRSA isolation rate, which means that hand hygiene is very important in hospitals.
In [3], the paper says about emergence of the novel Corona virus(SARS-CoV-2), which has caused unexpected challenges to health of the people of this world, the paper also aims at reducing the transmission rate of the disease. The paper explains about the virus structure and how is it different from that of the bacterial structure, which means that virus has single stranded or double stranded RNA or DNA encapsulated in 'capsid' and virus can replicate only in presence of a host and described as 'living entities'. Bacteria also have almost the same structure including DNA or RNA along with 'Cell Membrane' and can replicate without a host.

2. PROPOSED SYSTEM

Here, An Arduino Uno microcontroller is used since it is easy to program, has inbuilt ADC, DAC. The input to the Arduino is given using an ultrasonic sensor, which is used to sense the distance, it emits ultrasonic frequency from one side and the notes the time taken by sound wave to get reflected back. When the sensor senses the hand, at a distance less than 7cm from the sensor, the Arduino gives a 100ms pulse from its digital output pin. The pump cannot be used directly; hence a relay is used as a switch. The relay accepts the pulse from Arduino and makes the pump run. The pump is 3 to 12V submersible type, which pumps out a few drops of hand sanitizer on to the hands, after pumping, the distance is sensed for every 1000ms(1s) for scanning purposes.

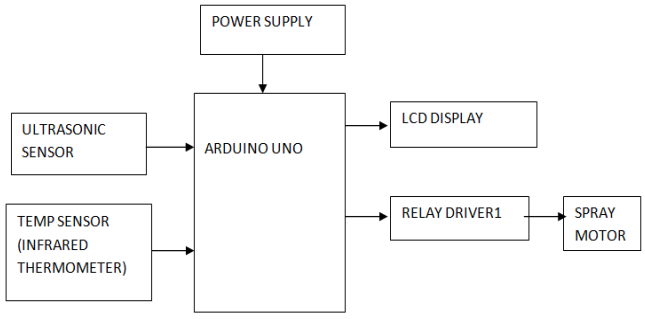

Fig -1: Block Diagram

2.1 Arduino UNO:

It is a microcontroller board developed by Arduino.cc and based on Atmega328. Arduino is an open-source prototyping platform in electronics based on easy-to-use hardware and software. Subtly speaking, Arduino is a microcontroller based prototyping board which can be used in developing digital devices that can read inputs like finger on a button, touch on a screen, light on a sensor etc. and turning it in to output like switching on an LED, rotating a motor, playing songs through a speaker etc.

UNO is based on ATmega328P microcontroller. There are two variants of the Arduino UNO: one which consists of through – hole microcontroller connection and other with surface mount type. Through-hole model will be beneficial as we can take the chip out in case of any problem and swap in with a new one. Arduino UNO comes with different features and capabilities. As mentioned earlier, the microcontroller used in UNO is ATmega328P, which is an 8-bit microcontroller based on the AVR architecture.

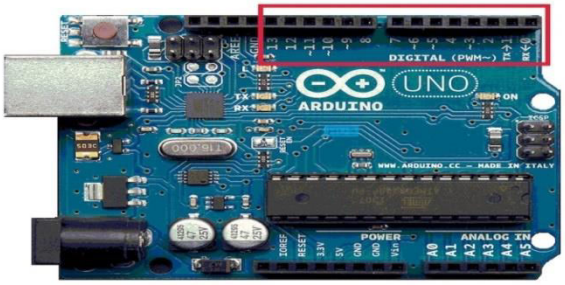

Fig -2: **Arduino UNO**

2.2 Temperature Sensor:

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. Integrated into the MLX90614 are a low noise amplifier, 17-bit ADC and powerful DSP unit thus achieving high accuracy and resolution of the thermometer.

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. Integrated into the MLX90614 are a low noise amplifier, 17-bit ADC and powerful DSP unit thus achieving high accuracy and resolution of the thermometer.

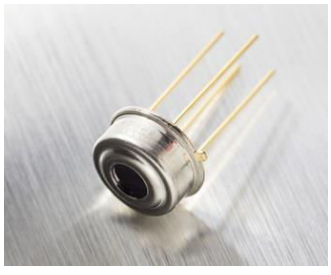

Fig -3: **Temperature Sensor**

2.3 Ultrasonic Sensor:

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo.

Typically, a microcontroller is used for communication with an ultrasonic sensor. To begin measuring the distance, the microcontroller sends a trigger signal to the ultrasonic sensor. The duty cycle of this trigger signal is 10µS for the HC-SR04 ultrasonic sensor. When triggered, the ultrasonic sensor generates eight acoustic (ultrasonic) wave bursts and initiates a time counter. As soon as the reflected (echo) signal is received, the timer stops. The output of the ultrasonic sensor is a high pulse with the same duration as the time difference between transmitted ultrasonic bursts and the received echo signal.

Fig -4: Ultrasonic Sensor

2.4. Relay Driver Circuit:

A relay driver circuit is a circuit which can drive, or operate, a relay so that it can function appropriately in a circuit. The driven relay can then operate as a switch in the circuit which can open or close, according to the needs of the circuit and its operation. Since DC and AC voltages operate differently, to build relay drivers for them requires slightly different setup. We will also go over a generic relay driver which can operate from either AC or DC voltage and operate both AC and DC relays. Now that we're using a transistor to drive the relay, we can use considerably less power to get the relay driven. Because a transistor is an amplifier, we just have to make sure that the base lead gets enough current to cause a larger current to flow from the emitter of the transistor to the collector. Once the base receives sufficient power, the transistor will conduct from emitter to collector and power the relay.

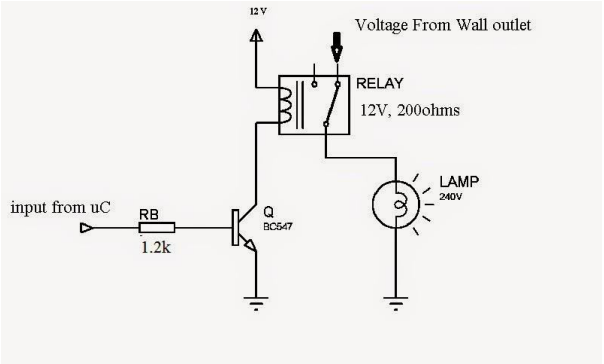

Fig -5: Relay Driver Circuit

2.5. LCD display:

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

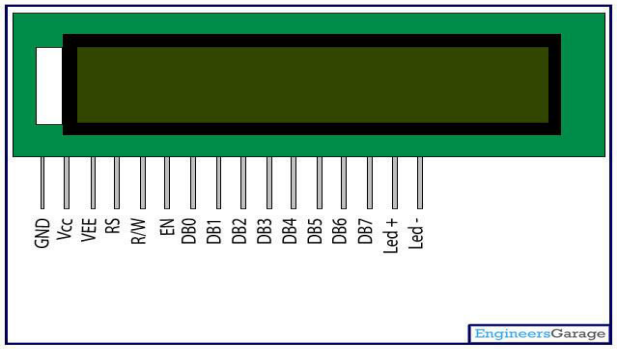

Fig -6: LCD Display

2.6. DC Spray Motor:

- 385 tiny self-priming pump USES is very wide, in home appliance, medical treatment, the model of DIY, aquatic equipment, etc, to application, main implementation pumping, cold water circulation, and other functions.

- Working voltage: DC6V - 12V
- working current: 1A (power must achieve 6 w above)
- Pump size: 40 mm * 90 mm * 35 mm
- Outlet diameter, diameter 6 mm, outside diameter of 8.5 mm

Fig -7: DC Spray Motor

3. CONCLUSIONS

The design and development of a non-contact temperature reader and sanitizer dispenser (NTRSD) system is presented in this study. The system is intended to help prevent the spread of SARS-CoV-2 infection and assist in maintaining and/or improving community health and reducing the negative impact of the infection on the economy and society.
From the above paper, we come to know that alcohol based hand sanitizers are more effective than soaps, and also easy to use. The paper also says that non-contact dispensing is again important to prevent pathogen spreading and finally, hand hygiene is most important and must be part of our daily life. Here we also calculate temperature of person wirelessly.

The system surely helps in implementing the hand hygiene without any challenges as it is a must to sanitizer if you are to access any entry point. It is much safer and more recommended due to its touch less property which zeros down any chances for cross-contamination. This is a low cost user friendly system that anyone can make use of. All the devices communicate well. It can be concluded here that the system has been successfully implemented and the aim is achieved without any deviations. The results achieved in this project are genuine and are a product of sincerity and hard work.

ACKNOWLEDGEMENT

We take this opportunity to thank our project guide, Mr.A.H Ansari for his guidance and support throughout the course duration. His efforts to clear our concepts and to help us code the entire algorithm were valuable for the development of this project. His role as a project Guide helped us to meet all our deadlines.

REFERENCES

[1]Jessica Hillburn MT(ASCP),CIC, Brian S Hammond, Elanor J Fendler PhD, Patricia A Groziak MS, "Use of alcohol hand sanitizer as an infection control strategy in acute care facility", American Journal of infection control Volume 31,Issue 2, April 2003. [2]

[2]Satoru Mitsuboshi, Masami Tsugita, "Impact of alcohol-based hand sanitizers, antibiotic consumption, and other measures on detection rates of antibiotic resistant bacteria in rural Japanes hospitals", Journal of Infection and Chemotherapy, 2018. [3]

[3]Golin, A. P., Choi, D., & Ghahary, A. "Hand Sanitizers: A Review of Ingredients, Mechanisms of Action, Modes of Delivery, and Efficacy Against Coronaviruses". American Journal of Infection Control ,2020.

[4]https://shareok.org/bitstream/handle/11244/11052/Wan_okstate_0664D_ 12910.pdf

[5]https://create.arduino.cc/projecthub/akshayjosepp66/covid-19-automatic-hand-sanitizer-78cf6b

[6]https://create.arduino.cc/projecthub/search?q=sanitizer+dispenser