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Automatic Dry Hand Sanitizing Device

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Abstract: ***The world faced so many problems during the Covid-19 pandemic. Washing our hands was an integral part of preventive measures of the Covid-19. But it is found that it wastes so much water in the world. Many people do not have access to clean drinking water and face water scarcity. The sanitizer is also used by many people. But excessive use of sanitizer with high alcohol concentration leads to dry, itchy skin. The indirect consumption of sanitizer through the hands leads to the risk of other health conditions. In this proposed system, fog making technology is used for dispensing sanitizer. So that only the required quantity of sanitizer is dispensed and it covers the entire surface area of hands, guaranteeing the disinfection of hands. This system is proposed to reduce water usage by around 90%. It also saves 20-30% of the water that rolls over the hands while washing the hands and also the water required for washing hands. This system did not completely replace the handwashing method but it helped in saving a remarkable quantity of water. It also helped in preventing skin diseases and other potential health hazards.***

Keywords: ***Sanitizer Dispenser, Fog Maker, Temperature Detector, IR Sensor, Microcontroller.***

I. INTRODUCTION

In the Covid-19 pandemic, washing hands was an integral part of life. Many people have the tendency to keep the tap on while rubbing soap on their hands. In that case, an automatic contactless tap is beneficial for avoiding cross-contamination and saving water [1]. The system still wastes the water, which runs over hands during hand wash, which is about 20-30%.

To tackle the above-mentioned problem, using a sanitizer is a very good idea. A contactless sanitizer dispenser was proposed. An ultrasonic sensor was used to sense and send the signal to the microcontroller. The controller senses the given data and activates the pump and solenoid valve. The sanitizer is dispensed through the nozzle [2]. There was no control over the quantity of sanitizer which was being dispensed. Even if that was determined, more sanitizer is required than needed by the user to reach the whole area of the hand, as the user spreads it manually. Excess use of sanitizer leads to skin diseases and health hazards.

Using a fog sanitizer for disinfection is a very good idea [3]. This method was for surface disinfection. A similar mechanism is used for hand disinfection with some changes making it suitable for hand disinfection. It will require less quantity to cover the entire surface of the hands.

In the proposed system, fogging mechanism is used for hand disinfection. The main goal was to achieve effective sanitization without cross-contamination, by saving water and using the minimum quantity of sanitizer. The temperature detector is added to the system to check the user's temperature and decide whether the person will be allowed on the campus or not. The Figure 1 shows the block diagram of the system.

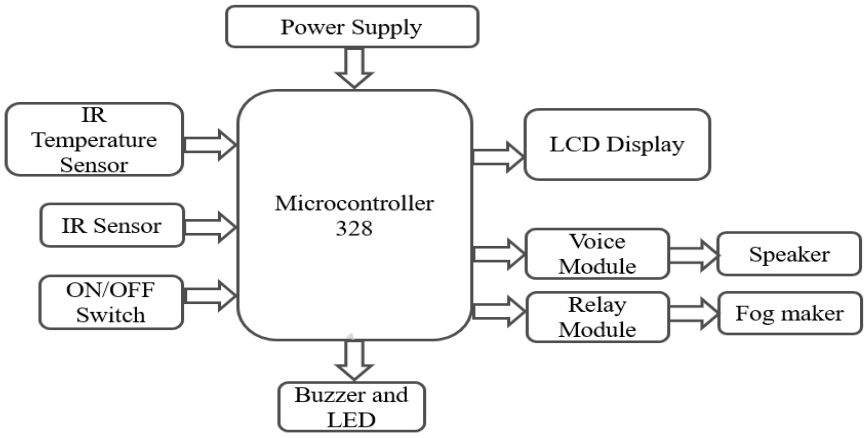


Fig. 1 Block diagram of the system

II. METHODOLOGY

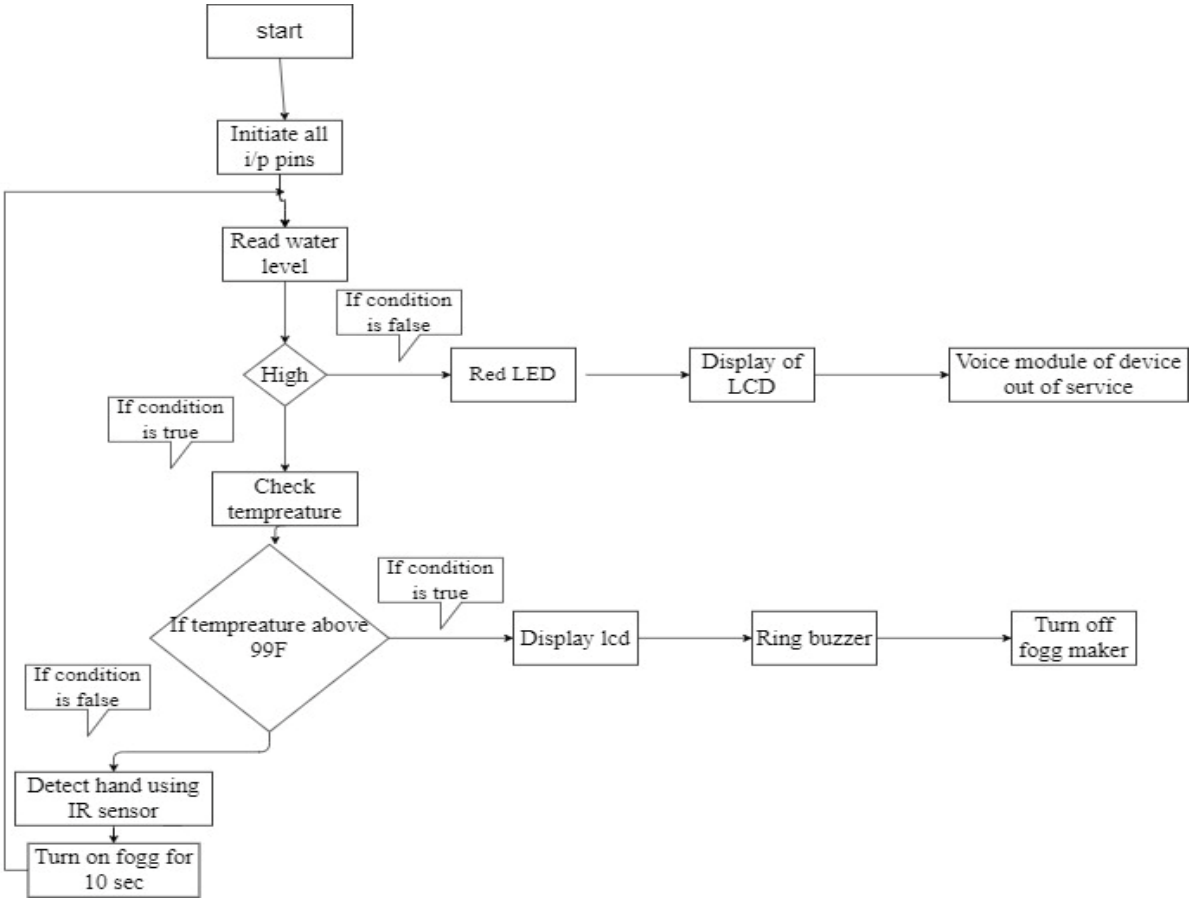


Fig. 2 Flowchart of the system

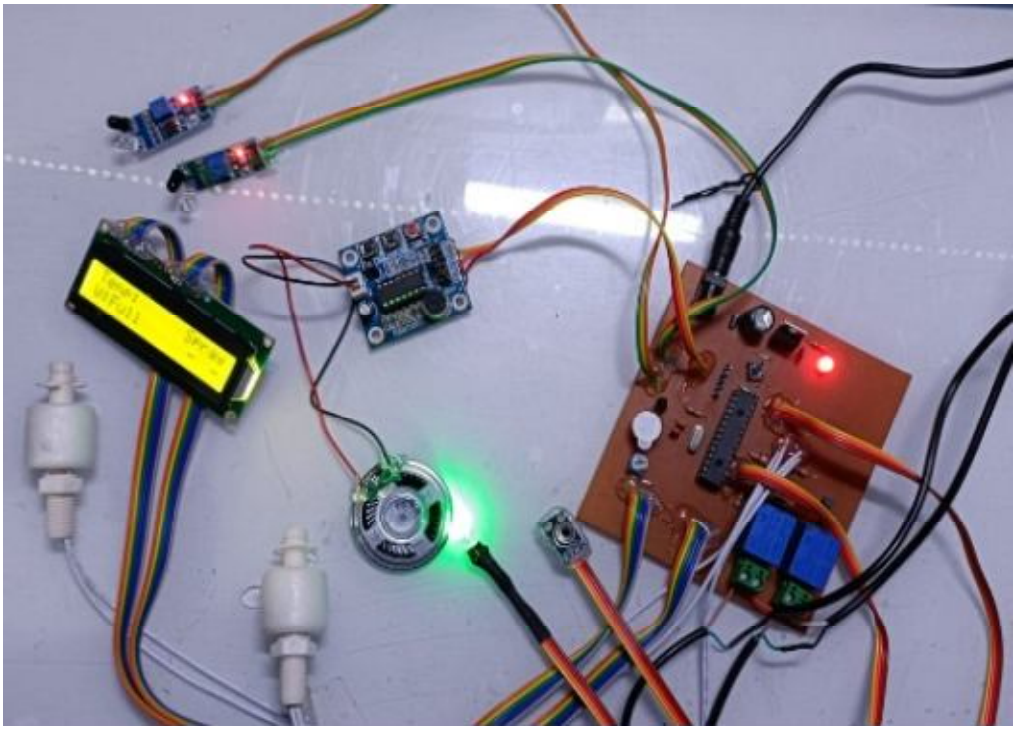


Fig. 3 Connection of the components

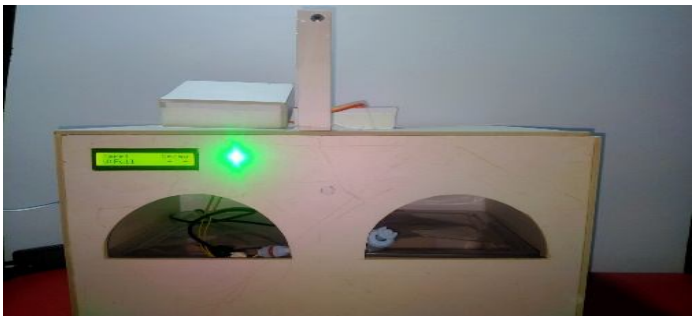


Fig. 4 Working model

The Figure 2 shows the flowchart of the system. The Figure 3 shows the connection of the components.
The system uses 3 main power supplies, 12V for the system and 24V for each relay module. Voltage regulator converts 12V supply to 5V, as the system requires 5V to run. Two liquid level indicators are added to the system which are inserted in the sanitizer tanks. Two sanitizer tanks are attached to the system. The float sensors detect the level of the sanitizer in the respective tanks. RGB LED is connected to show different levels of sanitizer in the tank. When the sanitizer tank is full, the Green LED glows. When sanitizer is at medium level, Blue LED glows. When the sanitizer level is very low, Red LED glows. In this case, the relay is not activated and the sanitizer is not dispensed. The LCD displays “out of service”, and the added voice module also notifies the same through a speaker. This notifies the user that refilling is needed. In the other two conditions, the device is in ‘use’ mode. That means the relays will be activated. In the ‘use’ mode, the temperature sensor MLX90614 detects the temperature of the user. The normal body temperature of the human body is around 99F. If the temperature of the user is above 99F then the warning is given by ringing the buzzer. The LCD also displays the warning and the fog makers remain off. When the temperature of the user is below 99F, the IR sensor detects the presence of the hands. Two IR sensors are used to detect the Left and Right hands separately. It gives the signal to the microcontroller Atmega328. The microcontroller activates the relay module. The fog maker dispenses the sanitizer fog. If one hand is inserted that activates only one fog maker on that particular side. The fog maker dispenses the fog for 10 seconds, and then the system stops. The Figure 4 shows the final model. A temperature sensor located at the top, measures the temperature. Whether the person will be allowed on the campus or not, is decided depending upon the temperature of the user. The LCD and RGB LED are added for notification. The semicircular cutouts are there for the user to insert the hands. The fog sanitizer is dispensed inside the chamber which is used for disinfection.

III. RESULTS AND DISCUSSIONS

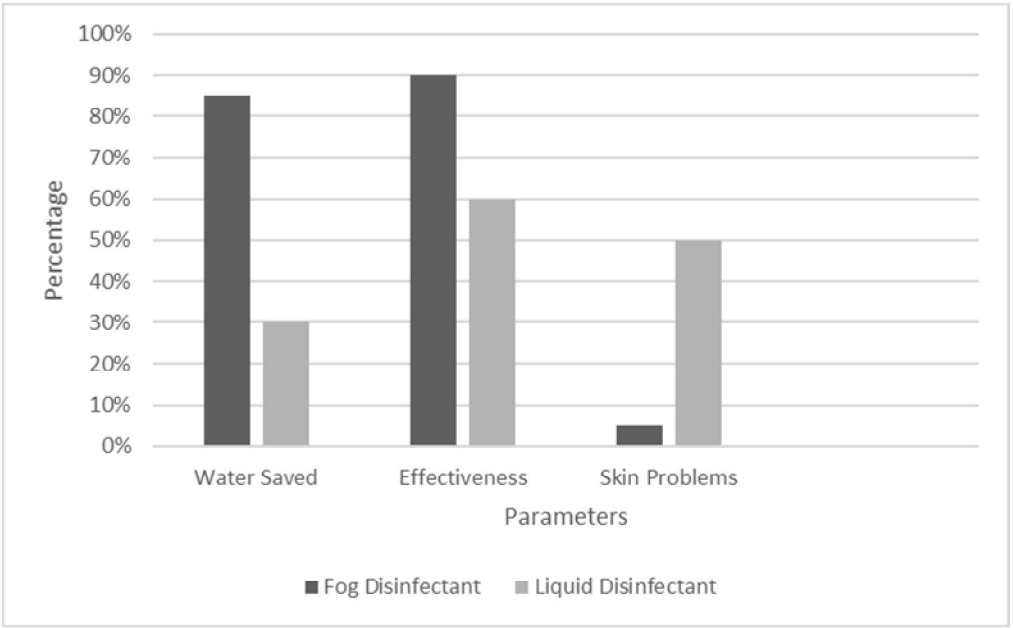


Fig. 5 Effects of fog disinfectant and liquid disinfectant

The Figure 5 shows the effects of fog disinfectant vs effects of liquid disinfectant. Water saved while using the fog disinfectant is 85%. Only 30% of water is saved while using the liquid disinfectant. This helps to reduce the problem of water scarcity.
The effectiveness of the fog disinfection is 90% and the liquid disinfection is 60%. As the little quantity of fog sanitizer is sufficient to spread over the entire surface of the hands. This prevents the excessive use of harmful sanitizer.
Skin problems are only 5% that too in a super sensitive case in the fog disinfection and the skin problems are around 50% in liquid disinfection. This assures the prevention of skin diseases and other health problems caused by overuse of alcohol-based sanitizer.
The necessary results are achieved by the proposed system. It clearly shows the effectiveness of the fog disinfectant over the liquid disinfectant and the traditional hand washing method.
The temperature feature also helps to prevent the spread of the virus through cross-contamination. The warning through the LCD and buzzer gives an alert about the infected person.

IV. CONCLUSIONS

The proposed system helped in the prevention of Covid-19. The temperature detector gave an alert about the infected user and the Fog Disinfectant helped in maintaining hygiene. The system is designed to save water and prevent skin irritations caused by high concentration liquid sanitizer and other health hazards.
In future, the system can be modified to refill the tank by itself as it is the only function that needed to be done manually. Further, it can be modified to work on batteries which will make it more portable.
But overall, the goals which were set while making this system are achieved.

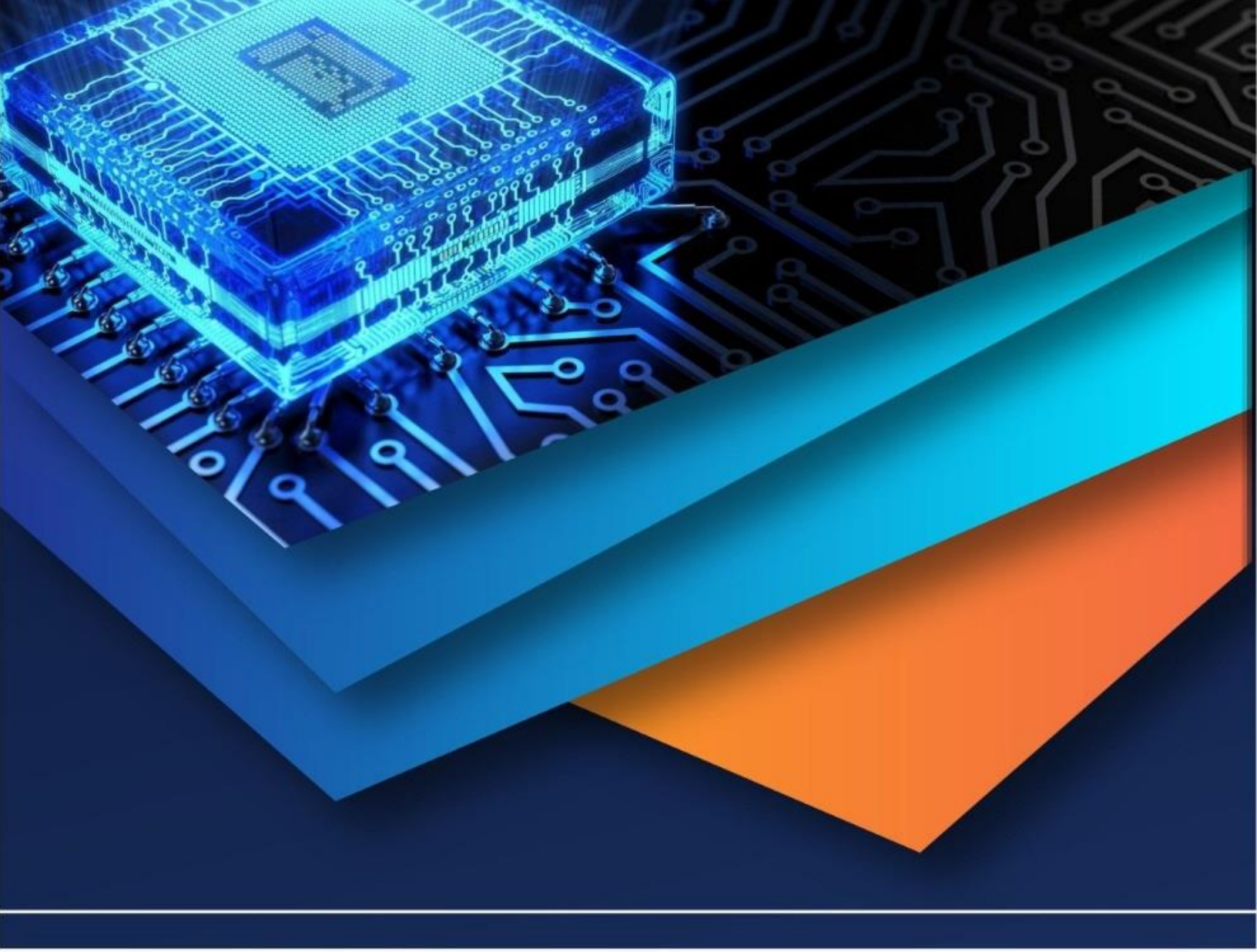
V. ACKNOWLEDGEMENTS

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