Handwashing Machine by Fog Disinfection to Save Water

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Abstract— Since the start of the COVID-19 pandemic, it is recommended to wash your hands several times a day. The problem of irrational water use will cause more problems than the pandemic itself. To solve this problem, we have developed a system that allows you to wash your hands without using more than 96% water than the traditional water usage. When the faucet is open, only 20-40% of the water touches the skin and the rest of the water is simply wasted. Our proposed device goes ahead even further and plays important role to save water. The machine is integrated with a tank and it is filled with water with a safe herbal disinfectant. When the user inserts his hands into the system, the water mist system activates automatically, converting the water in the reservoir into mist leading to the chamber. After exposing the hands to water mist for 10-15 seconds, the user hands gets sanitized. The machine consists of two IR sensors that detects the users hand and activates the Ultrasonic Piezoelectric Humidifier which is driven by nodeMCU ESP8266.Thus, the machine we offer can be sterilized by hand washing while saving a lot of water.

Key words: Handwashing system, COVID-19, nodeMCU ESP8266, Ultrasonic Piezoelectric Humidifier, IR sensor.

I. INTRODUCTION

The relevance of hand washing cannot be downplayed, particularly in improving countries where it is common practice to eat with hands. In some emerging societies, there is often a hesitation to wash hands before meals and in some, hand washing has established a generally common practice. Wanting to eat with your hands has been continuing for decades before anyone suddenly learned of washing their hands. So, along the way, through technologies and hygiene measures, individuals are taught to improve hand washing. Hand washing is the perhaps most effective way to avoid the transmission of diseases. Not washed or badly clean hands are very popular forms to transmit many infections such as fever, colds, diarrhea, sore throat, and other hand-borne diseases. Hand Hygiene is one of the most effective strategies to mitigate the transmission of pathogens and avoid outbreaks, such as the virus COVID-19.

Community members will provide a vital role in the battle against COVID-19 by implementing regular hand hygiene as a component of their daily activity. Promoting the practice of hand washing with soap and water is one of the simplest, low tech and most cost-effective public health measures to prevent transmission of COVID 19 as well as many other communicable diseases. The COVID- 19 outbreak has given renew attention to the failure of community preparation and its effect on urban health in emerging nations. Soap must be used in association with flowing water in handwashing is a primary method to avoid the transfer of COVID-19. In this health practice, it will fight COVID-19 and will help individuals associated with health risks and those of the children.

In fact, this is an important method of infection control or limiting the spread of this pandemic. Better soap-washing percentages on key public health instances have been shown to be very reliable. The availability of hand washing stations is perceived to be a simple personal hygiene activity with a positive externality in terms of public health benefits. Its access also depends on the availability of a secure supply of a sufficient quantity of water and reasonable rates. From the study of Jolan BaccaySy and his friends, they stated that multi-station automatic hand wash provides complete and hygienic hand washing activities with soap and water through its several stations that apparently and essentially operate independently of each other, satisfy the WHO hand washing duration standard and accommodate the WHO hand washing technique. Disinfecting our hands from time to time is a very important factor in fighting the pandemic. But does it actually require so much water to disinfect your hands.

The NodeMCU (Node Microcontroller Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. That makes it an excellent choice for

Internet of Things (IoT) projects of all kinds.

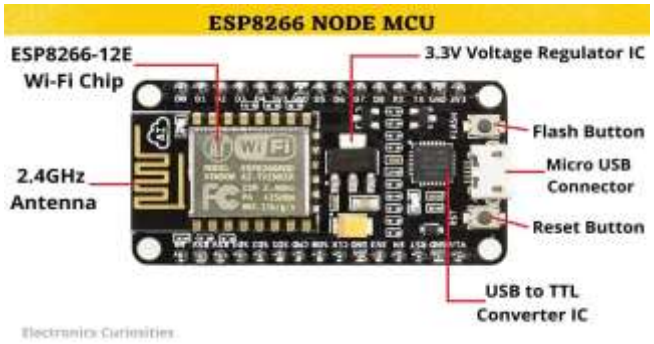

Fig. 1: NodeMCU ESP8266

There are four power pins, I2C Pins to connect I2C sensors and peripherals, 17 GPIO Pins (which can be assigned to functions such as I2C, I2S, UART, PWM, IR Remote Control, LED Light and Button programmatically), ADC Channel (10-Bit precision SAR ADC), UART Pins (has two UART Interfaces), SPI Pins, PWM Pins, Control Pins.

II. METHODOLOGY

The machine is integrated with a tank below it. The tank is filled with water along with any safe herbal disinfectant liquid. The machine is driven by a NodeMCU.

IR Sensors are used within the system as a transmitter and a receiver. When the user inserts his hand into the system, the IR sensor triggers a water fogging system that converts water in the tank to fog and drives it in the hand wash chamber. The water fogging system consists of a ultrasonic humidifier which produces a cool mist by a metal diaphragm vibrating at high frequency. The humidifier is interfaced to the Node MCU through a Relay. Now the user can sanitize his hands for a duration of 10 - 15 seconds. The Fog has the ability to reach all corners of the hand in less than 5 seconds as it is in gaseous state (water vapor) and provides effective sanitization. As our system is automated the humidifier goes off when the user takes his hands out of the handwashing system.

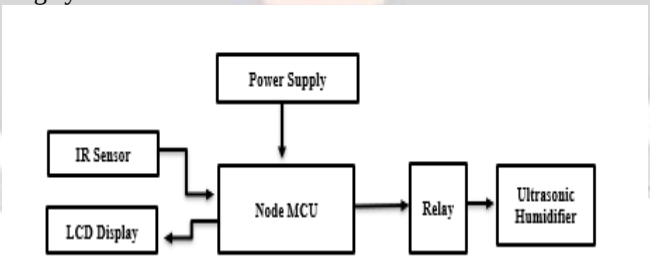

Fig. 2: Block diagram of fog disinfection system

Figure 2 shows the Block diagram showing the components like IR sensor, buzzer, LCD display, Relay, Power supply and Fog maker interfaced with Node MCU.

III. RESULT & CONCLUSION

The system was portable and was automatic in operation.The non-contact design approach prevented the spreading of viruses. The proposed system used less than 95% of the traditional water consumption thereby saving a huge amount of water.The water was mixed with disinfectant and the fog produced by the system was used to effectively sanitize our hands by following the WHO protocol.

Conclusion:

Keeping hands clean is one of the most important to avoid getting sick and spreading germs to others, especially in this pandemic time since many diseases are spread by not washing hands with soap and clean water properly. The system requirement was based on the World Health Organization (WHO) protocol requires that hand washing should be done for duration of 20 seconds.

The use of non-contact automated hand washing device is one of the best strategies to eliminate or decrease the spread of viruses. It follows perfectly the required hand wash protocol from the WHO and provides effective sanitization at the same time reducing the wastage of huge amount of water.

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