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An Internet of Things assisted Smart Hand Sanitizer with Health Monitoring System help to reduce rapid spread of COVID-19

Biplab Chowdhury and Tanmay De

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An Internet of Things assisted Smart Hand Sanitizer with Health Monitoring System help to reduce rapid spread of COVID-19

Biplab Chowdhury[1] (Author) *Tanmay De[2] (Author)*

Computer Application Department

Netaji Subhash Engineering College

Techno city, Garia, Kolkata, West Bengal, India

Email: biplab0105@gmail.com[1] tanmay1974de@gmail.com[2]

Abstract- **Hand hygiene is the most essential part of human life in today's state of affairs as it may be contaminated effortlessly from direct contact with airborne microorganism droplets from coughs and sneezes due to pandemic outbreak of Coronavirus Disease-2019. It is viable to stop the transmission chain of the virus with a habit of acceptable_hand sanitization. It may additionally be carried out with non-contact and strict contamination manage tool like automated hand sanitizer dispensing machine keeping excellent hand hygiene in public place. The success of the hand sanitization relies upon on the use of high-quality hand disinfecting substances like water-based, alcohol-based hand sanitizer and its dispensing apparatus. To date most of the effective hand sanitizer created with composition with alcohol-based formulations containing 62%–95% of alcohol. It can kill proteins of microbes and has the potential to inactivate viruses.**

This research work presents an IoT assisted Smart Hand Sanitizer that can sanitize hand successfully in addition it collects some necessary facts such that Humidity of ambiance, body temperature of people automatically, additionally it monitors the liquid stage of sanitizer and geographical location of device to the server. Such necessary information collected, processed and transferred to ThingSpeak cloud server thru ESP8266 nodeMCU WiFi network. This fact is analysed and show thru line graph or gauge in channel. This technique is carried out the usage of IoT technology. One can get sanitizer liquid stage records rapidly so that it can be refilled with much less interruption of the service. Sanitizer dispensing hand-sanitizer liquid can generate spray mist to users' hand with minimal liquid. This automated equipment can be use in educational, healthcare, economic group in public. This gadget makes use of much less hand-sanitizer liquid and have much less electricity consumption. This work can be beneficial in enhancing the way to sanitize hand, monitoring individual's fitness that can assist to forestall hand transmission of coronavirus. This equipment generates excessive strain droplets of sanitizer that can sanitize the pores and skin and edges of nail tips.

Keywords-- COVID-19, IoT, hand sanitizer, ThingSpeak, ESP8266 nodeMCU, body temperature

I Introduction

On date, the new coronavirus, SARS-CoV-2, has become a global health issue when it has been declared a worldwide emergency by the world Health Organization (WHO) because the occurrence continues. Transmissions between human to human are delineate with incubation times between 2-10 days, its unfold via droplets, contaminated on hands or surfaces. The Coronavirus Disease-2019 pandemic has up to be a worldwide public health concern and led to in depth use of hand disinfectants given its contagious nature. When Coronavirus outbreak has been declared pandemic by WHO, then a question arises how to protect yourself and others from the spread of COVID-19. WHO gives us some guidelines to reduce your chance of being infected. To protect yourself and others against COVID -19, wash your hands frequently and thoroughly by alcohol-based Hand Sanitizer or soap and water. There was a total of 1.85 million in India and 18.1 million reported cases affecting over 200 countries worldwide as of 8thAugust 2020 [1]. There was a total of 18.4 million reported cases affecting over worldwide as of 4th August, 2020. Coronavirus 2 (SARS-CoV-2) can persist and remain infectious on surfaces up to 9 days [2,3]. The recent study reveals that transmission of SARS-CoV-2 is possible in the form of aerosol and fomite, and the virus can remain infectious in aerosols for hours and on surfaces up to days, but can be efficiently destroy the-positive single-stranded RNA structure [4, 5] by certain lipid solvents with 62–71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute. Hence, it is very essential to stop the transmission chain of the virus through contact isolation and strict infection control tools [6]. Using appropriate hand sanitizer is of utmost importance as hands may be contaminated from direct contact with patients' respiratory droplets from coughs and sneezes or indirect contact via surfaces, which may cause the transmission and spreading of the disease [7, 8]. The studies on SARS-CoV outbreak settings showed that providing

effective handwashing and hand sanitization facilities reduced the transmission chain [9].

Internet of Things (IoT) has brought revolutionary change in information system and communication technologies. IoT provides the access to large data and it allows embedded devices with different types of sensors and actuators to communicate and share information among them. Devices and systems are embedded with different sensors, software and actuators are connected with each other through internet. Using IoT objects are being sensed and that are controlled across the internet remotely. IoT generates opportunities as physical world is integrated into computer-based analytical systems. This integration results in reduced human interaction, improved efficiency along with economic benefit and accurate results [10]. The Internet of Things is transforming almost every area of healthcare system from patient care to hygiene monitoring devices. The IoT's compelling combination of compact and low-cost hardware and software creates a far-reaching impact for caregivers and patients alike in the form of improved accuracy, greater efficiency, lower costs, and enhanced health and safety.
This research presents an application regarding hand hygiene that use the wireless technology to monitor and report on hygiene compliance in the medical industry. The implementation of wireless sensors and flexible gateways are bringing unprecedented precision, including temperature, relative humidity, sanitizing liquid level monitoring of sanitizer dispensing system something as life-saving – as hand hygiene. Those sensors are equipped with a ESP6288 nodeMCU module that enables the hand sanitizers to create a mesh network. Each sanitizer unit is aware of the data collected by other units. Additionally, every device sends its longitude and latitude function to cloud Thingspeek cloud server. Thus, all units are mounted in distributed area can monitor via a central server. When a sanitizer machine sends empty sanitizer liquid data to the cloud then it is effortless to discover the place for the service of speedy replenish the liquid. It can save time and manpower.

Reliable and secure wireless connectivity can make significant contributions to improving enhancing healthcare delivery. The addition of wireless capabilities to sanitizing devices for better management, and maintenance. The connected world is here to stay safe, and it is already benefitting. By leveraging the all the possibilities the IoT presents, we can improve less transmission of widespread of Covid19. The IoT continues to support numerous applications, including sophisticated solutions that can not only make our lives easier, but save them as well. Using IoT as the technology combining smart sanitizing system it sends persons health data such as ambient humidity and temperature, person's body-temperature along with sanitizer liquid level to ThingSpeak website which can further analysed, it is also possible to keep a record of the person's health status. This will help the system to understand that person's more accurately.

In this research work, "Smart Hand Sanitiser" aimed no contact hand sanitizer dispenser apparatus embed with ambient relative humidity and temperature no contact infrared body temperature sensor and sanitizer liquid level sensor used to efficient and effective use of sanitization liquid and measurement of body temperature. In the dispensing module, it is safe for both Alcohol Based Hand Sanitiser (ABHS) and Non ABHS. The function of the device is to be used to sanitize specific area of hands using high pressure mist spray of liquid droplet using 0.3mm single fluid canonical nozzle spryer that can be better use of liquid flow. Only 10ml sanitizer is released for10 seconds and depending on moisture containment it dries the user's hand to get more sanitizer liquid effect. The objective is to sanitize hands with minimum wastage of liquid with maximum effects. It is being operated on fully autonomous that can sanitize hands wide area and collect ambiance RH and user's body temperature is one of the important factors to detect COVID-19 positive patient. All data are collected and transfer through WiFi network and transferred to ThingSpeak server. The proposed design is very compact and economical for long-lasting product. The device has been designed for sanitization of hands at entry and exit point in hospitals, malls, office buildings, residential buildings, airports, metro stations, railway stations, bus stations and critical installations. Proposed design is being expected to be very useful for entry/ exit point of isolation and quarantine centres in India.

The arrangement of the paper is as follows; introduction is enclosed within the section one. In section two literature survey is represented in section three proposed system, block diagram and system architecture discussed. Section four contains the layered architecture of the system, experimental result analysis is mentioned in section five and eventually section six is that the conclusion.

II Literature Survey

Joseph et al. [11] analysed knowledge supported social media with 3 approaches: content, descriptive, and network analysis on extracting the knowledge of people likings and dis-likings. Misra et al. [12] review on IoT and shows crucial challenges within the same field. The article describes a top-level view of the IoT conception and its connected technologies, application, and future scope of analysis of the realm. Gil et al. [13] reviewed on current IoT technologies, approaches, and totally different models used. Gómeza et al. [14] developed associate design for observation the health associated travail and it provides recommendations to patients with chronic diseases supported a metaphysics. The model developed for the system tested to be economical once making inferences involving the context. Li et al. [15] design a system nCappbased on IoT to diagnose COVID-19 earlier. As per existing data, questionnaires, and checked results, the designation is automatically generated as confirmed, suspected, or suspicious. Zaheer et al. [16] highlighted the necessity for standardization of protocols for smart town communication. Noah et al. [17] utilised the Centers for disease management and bar (CDC, USA) web site, and a comprehensive review of PubMed literature, and obtained data concerning clinical signs and symptoms, treatment and diagnosing, transmission strategies, protection strategies and risk factors for geographical region metabolic process Syndrome (MERS), Severe Acute metabolic process Syndrome (SARS) and COVID-19. Mohammed et al. [18] represented the functions of IoT applied sciences within the medical and tending self-discipline and highlighted the gettable. Mohammed et al. [19] developed a sensible helmet-mounted with thermal imaging structures for deciding the contaminated amongst the gang. It what is more equipped the automatic face recognition system. Scanning of the gang the

use of infrared Camera and if the heat of any man or feminine detected, then it'll capture the face the utilization of associate optical Camera. It what is more provides the place of the contaminated man or feminine via GPS.

Noushin Karimpouret al. [20] is implemented methods based on Internet of Things that are used for monitoring the hand hygiene of medical staff at they visit patient. They used ESP modules as a ad-hock base stations and smart-phones as edge nodes and it estimate the distances using RSSI values of Bluetooth to monitor the medical staff inside the patient's room. They used proximity-based solution to compare the RSSI measured on different ESP nodes that may assume that the mobile node is closest to an ESP node with highest RSSI value. They use trilateration-based approach with trilateration algorithm to locate the mobile node in the room.

Juhui Leeet al. [21] designed an automatic hand sanitizer system focused on using the elasticity of pumps and improving people's access to devices. This automatic hand sanitizer system is compatible with various containers. When one moves one's hand close to the sensor mechanism then the sanitizer container is pumped once. The proposed device is ultimately expected to contribute to contactless hand disinfection in public places that can prevent virus infection. It is also economical and eco-friendly by decreasing waste emissions

KrishnaKumar et al. design an IoT based architecture to solve any real-time problems like to detect COVID-19 effected one. Sensors are the input providers from the physical world, collected data transferred over a network, and actuators allow the things to react according to the input received from different sensors.

III Proposed System

a. Functional diagram:

In Figure 1 we describe our proposed machine which consists of a contactless body temperature dimension module measure temperature with MLX90614 sensor connected with nodeMCU module that switch statistics to cloud system. A tiny sensor DHT11 is linked with nodeMCU to measure ambiance temperature and relative humidity and facts transfer to ThingSpeak server cloud. The most important hand sanitization unit works fantastic when one put palms underneath the ultrasound sensor then it dispenses sanitizer liquid via 3mm canonical nozzle as mist that can sanitize hand with extensive spread. When a individual needs to sanitizer hand want to put palms beneath sensor and the time between completion of sanitization the machine measure body temperature and ambiance temperature, relative humidity and sanitizer liquid stage and switch data via Wi-Fi community to ThingSpeak server cloud. This information can display as graph for further analysis.

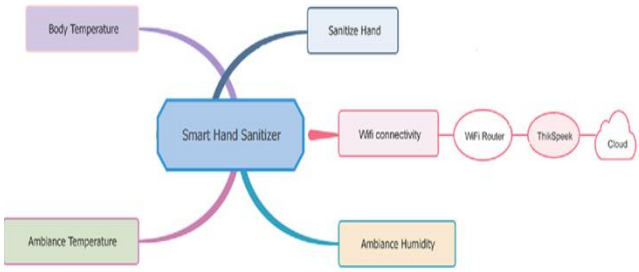

Figure 1: Functions of Smart IoT Enable Hand Sanitizer

b. Modules

The proposed device consists of five modules

1. *Hand Sanitization Unit:* This unit constructed for hand sanitization consist of sanitization liquid, ultrasound sensor for hand palm detection, high pressure pump, solenoid valve, liquid stage sensor for calculating sanitizer liquid level, are linked ESP8266 nodeMCU.

2. *Ambiance Relative Humidity:* Sanitizer liquid is extra energetic to kill COVID-19 virus on dry hand than moist hand. If one user's hand is moist, that can be measured from DHT-11 sensor, then a manipulate signal generated from nodeMCU to begin drier unit that can dry hands. The ambiance relative humidity value is transferred via WiFi module to ThingSpeak server cloud and that can show in form of line graph.

3. *Hand Drier*: It consist of a high-speed DC motor designed to blow air to user's hand. It begins when user's hand is moist getting value from sensor to nodeMCU generated signal relying on relative humidity.

4. *Individuals Body Temperature:* A sensor MLX90614 can realize body temperature from distance 5cm of men and women the use of infrared signal technology. Value ship to nodeMCU controller and to ThingSpeak server the use of WiFi network. Controller generate alarm if people body temperature is high. Measuring human's body temperature is one of the necessary components to become aware of COVID-19 contaminated patient.

5. *ThingSpeak cloud:* To use ThingSpeak server cloud first create an account. With ideal credentials one can logged in website. Then we have created a channel with private option. Then we have to create discipline and kinds of show our experimental data, additionally for in addition analysis.

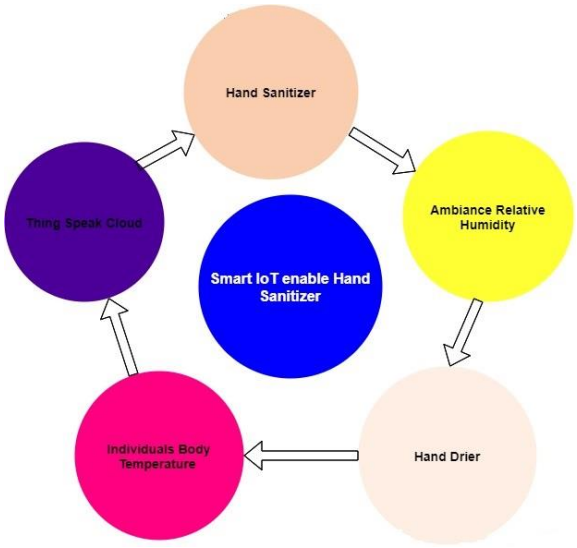

Figure 2: Modules of Smart IoT Enable Hand Sanitizer

c. Block diagram

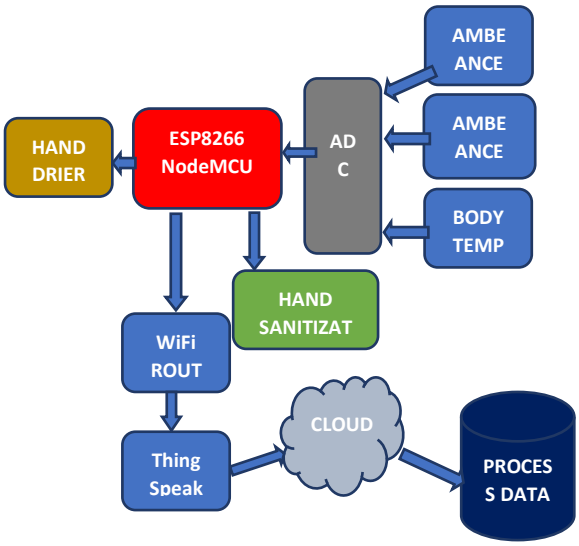

Figure 3: Block Diagram of Smart IoT Enable Hand Sanitizer

d. Flowchart:

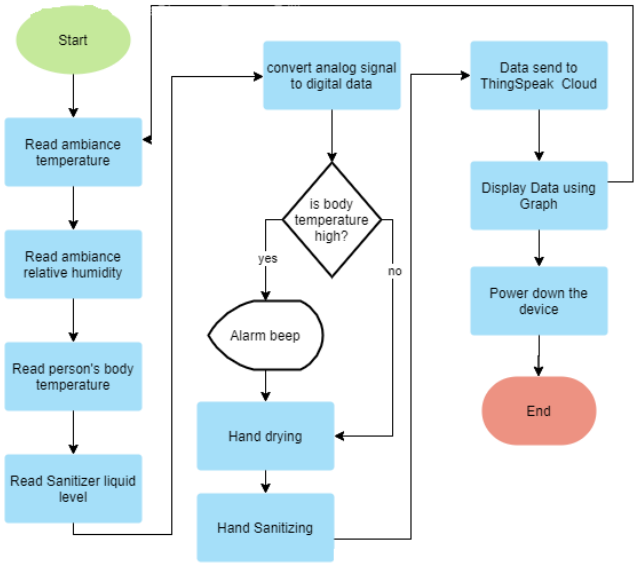

Figure 4: Flowchart of Smart IoT Enable Hand Sanitizer

IV Layered Architecture of the System

The proposed system has three-layer architecture. User region the palms for sanitization liquid is sprayed over palms earlier than that relying on ambiance temperature and relative humidity air blow to dry hands. At the equal time body temperature measured via contactless Infra-red thermometer. Collected data are processed by means of ESP8266 nodeMCU and that can switch to ThingSpeak server. In ThingSpeak server a channel for save and show records need to create. Four parameters Relative Humidity, Ambiance Temperature, Body Temperature, Sanitizer Liquid Level are gathered by means of proposed machine and show the end result on ThingSpeak server as plan that can be in addition analysed. If take's body temperature is excessive then it generates an alarm on computer for alert. Device liquid degree under the low degree generates any other alarm.

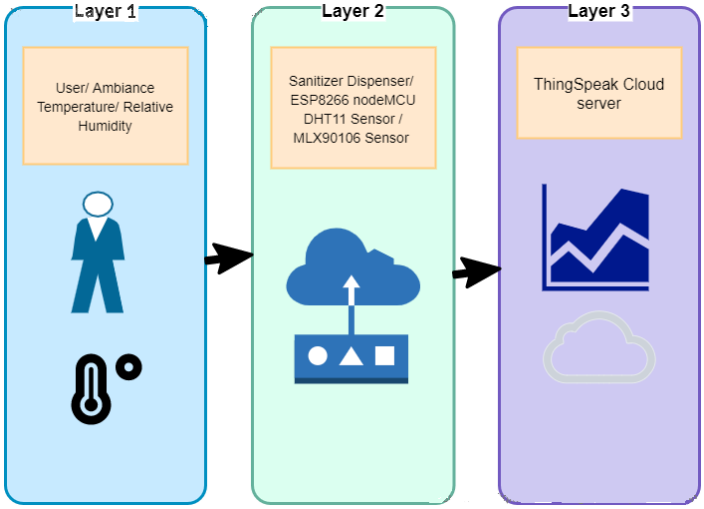

Figure 5: Layered Architecture of proposed system

V Experimental Result Analysis

ThingSpeak we create a channel in which private view the following field charts are used to display ambiance temperature, relative humidity and body temperature getting form device sensors. The channel id is 1136000, author id is mwa0000019077999 write API key is KUNP1S89JXFI3P4I. Data is recorded every 15 second. This data can be further analyzed using MATLAB analysis.

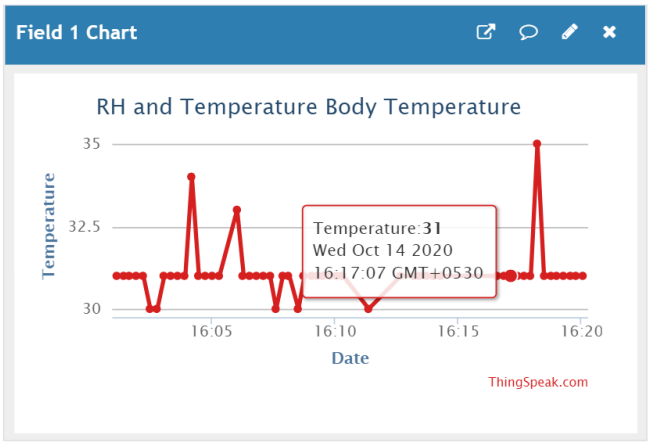

Figure 6: Ambiance temperature in centigrade recorded in ThingSpeak server

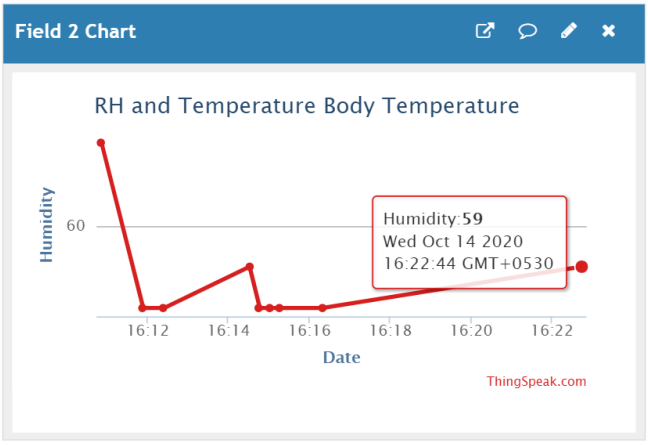

Figure 6: Relative Humidity recorded in ThingSpeak server

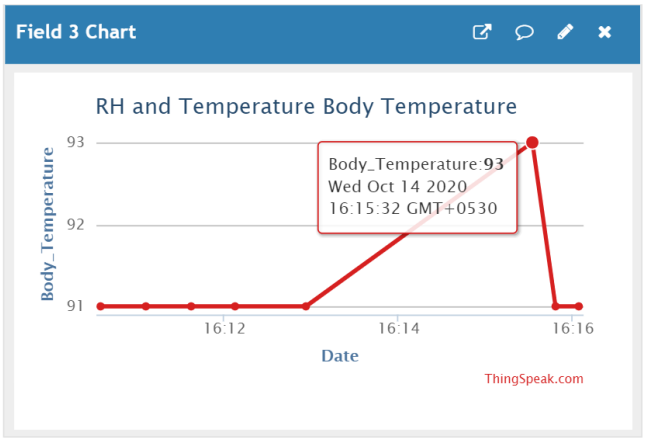

Figure 6: Persons body temperature in Fahrenheit recorded in ThingSpeak server

VI Conclusion

The method and technology employed in the research work is to assist to reduce and stop the transmission of spreading COVID-19 virus and can also observe some necessary parameters like person's body temperature using contact less infrared temperature senor, and if high temperature then generate alarm, information regarding health status of system like sanitizer liquid level status, and the device geographical location which is keep in cloud and analysed using WiFi. One can monitor the device status installed in geographical distributed location from the system latitude and longitude data. From the device data one can understand the sanitizer liquid level and can fill up liquid rapidly ensuing an uninterrupted service that assist to reduce the speedy transmission of COVID-19 virus.

Declaration of Competing Interest

Biplab Chowdhury, Tanmay De declare that there is no conflict of interest regarding the publication of this paper.

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