International Journal of Scientific Research in Computer Science, Engineering and Information Technology
ISSN : 2456-3307 (www.ijsrcseit.com)
doi : https://doi.org/10.32628/CSEIT228453

IoT Based Hand Sanitizer

Rudra Dutt, Akshat Srivastava, Tarun Aditya Kusupati, Basab Nath, Chandrashekhar Kumbhar
Ajeenkya DY Patil University, Charholi Budruk, Pune, Maharashtra, India

Article Info

Publication Issue :

Volume 8, Issue 4
July-August-2022

Page Number : 331-336

Article History
Accepted: 10 August 2022
Published: 30 August 2022

ABSTRACT

COVID-19 has become one of the crucial challenges in today's world. As a result, many major countries have failed to safeguard themselves from its spread. Wearing a mask and washing their hands at regular intervals are two of the most critical things that health experts are telling people to do to protect themselves from this virus. To avoid getting infected by the new coronavirus, hand cleanliness has become one of the most critical aspects of our daily life. Hand sanitizer is the bare minimum we can do to keep our hands clean, but authorities are concerned about the monitoring of sanitizer levels in public venues such as airports, malls, and universities. We propose a solution to this wide-spread problem by developing an IOT-based hand sanitizer that would display all the essential data of each dispenser deployed on a website. The boon of IOT has given us the ability to design a system which could help eradicate COVID- 19 and save lives.

Keywords : Monitoring, IoT, efficiency, NodeMCU, data analytics.

I. INTRODUCTION

We all know the current situation in the world right now: how COVID-19 has become a big problem for the world. People are now more focused and aware of maintaining good hygiene since we can reduce the chances of being exposed to the virus. Masks and sanitizers have become new norms in today's world. The mask protects us from inhaling the respiratory droplets of the other person or our droplets with another person, which could lead to the spread of the virus, and the sanitizer prevents the spread of the virus by killing the germs present on our hands

We have all seen contactless sanitizers being used in our societies, shopping malls, airports, and other large public places, but the authorities of these places face issues in being able to monitor the level of sanitizer remaining. As a result, we may have a situation where a sanitizer dispenser becomes empty and no one can detect it. To solve this, the authorities try to manually intervene and check for the sanitizer, but this process is time- consuming and not efficient. With our idea, we propose to develop an IoT based contactless hand sanitizer that would keep displaying the percentage of the sanitizer remaining in each dispenser on the locally hosted website. It would use green, red, and yellow color coding. If the percentage of the sanitizer remaining is 25% of the total level, the color would change to yellow, and when it runs down to 0%, it would change to red.IoT-based applications have become an important part of our lives today, and their importance is undergoing continuous growth as they

are enabling large-scale deployment and smart city applications like smart parks, waste management, etc.

Our motivation for this project was the goal of focusing on monitoring and efficiency, we all have seen hand sanitizer in malls and airports we have seen when the sanitizer becomes empty most of the time people don't refuel them due to which people try to take out sanitizer from it but with no sanitizer it could lead to a covid virus spread as well, so with this in mind we decided to focus on the point of monitoring so it could lead to easy refuelling of the dispensers.

II. LITERATURE REVIEW

Whenever we start to think or prepare any idea, we always think about whether the work has been done in this field before or not. We did the similar thing. We went through a lot of research papers on this topic and we found a few helpful papers that helped in our idea formulizing. Design of automatic hand sanitizer compatible with various containers [1] in this paper the author suggests a design of automatic hand sanitizer compatible with various sanitizer containers. We also heard about some reports where it was written that most of the hand sanitizer remains empty when they are over. This helped us in developing the idea of contact-based sanitizer with focus on monitoring. Other useful research paper that we got for our project was IOT-Based Sanitizer Station Network: A Facilities Management [2] in this paper the author focused on achieving data capture, communication, and analysis, the system combines low-cost, wireless sensors, Lora WAN, and cloud-based computing capabilities. The proposed method was tested in the field in a big building on a university campus to determine network signal coverage and sensor operating efficacy for facility monitoring. The findings revealed that a Lora WAN formed from a single gateway may link to sensors located throughout the building, with sensor nodes capturing and replaying events throughout the network for further analysis. Overall, this study showed how an IOT-Based Sanitizer station network may be used to track public health mitigation strategies in a big facility, which helps to reduce the burden of preserving public health during and after a pandemic. In this paper IoT based Automatic Hand Sanitizer Dispenser [3]. The author suggests Hand sanitizer distribution machine is an automated, non-contact, alcohol-based hand sanitizer dispenser that can be found in hospitals, workplaces, businesses, schools, and more. Alcohol is a solvent that is also a very effective disinfectant when compared to liquid or solid soap. It also does not require water to be washed away because it is volatile and evaporates rapidly after contact with the hands. It has also been established that a concentration of alcohol more than 70% can kill Coronavirus in the hands. An ultrasonic sensor detects the presence of a hand near it, and the Arduino uno is used as a microprocessor to detect the distance, resulting in the pump running to dispense the hand sanitizer. The IR Sensor is a photodiode that detects the presence of a human hand and controls the motor pump from the liquid. To control the flow of the sanitizer's liquid, the motor is connected to an RC timed delay arrangement, and the pipe is connected to a reducer. In the system, there are three types of control LEDs. White LED is used to indicate that the setup is in operating mode and that the battery is being utilized. From Contactless Disinfection Intelligent Hand Sanitizer Dispenser for Public & Home towards IoT Based Assistive Technologies for Visually Impaired Users Institutional Responses to the COVID-19 Pandemic. Gordana Lastovicka-Medin, Backovic Vanja In this study, they describe a contactless solution for an intelligent hand sanitizer with automated induction disinfection. The contactless sensor in their prototype is unique in that it is unaffected by skin color. It also has an RFID tag that allows it to be adjusted for visually impaired users. Because access to the presented prototype was not feasible before or during COVID-19, the research

was set as a response to COVID-19 and represents local needs. In one more paper the author suggests IoT- Based Smart Hand Sanitizer Dispenser (COVID-19) [4]. In this paper the author suggests Despite developments in the medical field, coronavirus has proven to be an unseen foe for which the world is unprepared. Contact and respiratory droplets have been the primary modes of transmission for the virus. Hand sanitization and wearing a mask are the most popular methods for preventing infection and spreading of the infection. There is an urgent need for a technology that can do these functions accurately and without human intervention in public settings such as general stores or banks. This intelligent hand sanitizer dispenser completes the task without the need for human intervention. It automatically administers the sanitizer and checks the body temperature. An ultrasonic sensor and an MLX90614 temperature sensor are used to do this. All of the sensors and actuators are linked to a microcontroller, which serves as the device's brain. It also determines whether or not the customer (human) is wearing a mask. If a customer does not wear a mask, he or she will not be allowed inside the shop, and the shop's gates will remain closed. OpenCV is used to recognise the face in real time, and then a convolutional neural network is utilized to classify it. Finally, all of the data is concurrently placed in the cloud for later analysis, and there was one paper that focused on the monitoring level (smart sanitizer dispenser with level monitoring) [5]. An automatic sanitizer dispensing unit with no physical contact is known as a smart sanitizer. It's an alcohol-based hand sanitizer that can be used in a variety of settings, including schools, hospitals, workplaces, and offices. Alcohol is essentially a solvent, but it is also a very effective disinfectant, which is critical in this present pandemic. Because alcohol is volatile, it vaporizes very instantaneously after contact with the hands. It is also well known and established that alcohol concentrations more than 70% can destroy Coronavirus in the hands. We're using an IR sensor to detect a hand near the bottle, an esp32 microcontroller to detect the distance, and a pump to pump out the hand sanitizer as a result. The esp32 will sense the distance and, as a result, will send an alert when the % of sanitizer in the bottle is less than the threshold. The esp32 features inbuilt network connectivity, such as WIFI or Bluetooth, which is used to transport data from the esp32 to the cloud. The esp32 data is analysed, and the appropriate alert is issued.

Design

Design talks about something more than look and feel, it talks about harmony. The harmony of a never-ending quest to find the perfect balance between each atom and component for the client's complete satisfaction. We have handcrafted our hardware and software to match the moral compass of our vision.

(a) Hardware

(a.1) NodeMCU

NodeMCU is an open-source firmware and development kit for prototyping and building Internet- of-Things (IoT) products. It comprises firmware that operates on Espressif Systems' ESP8266Wi-Fi SoC and hardware based on the ESP-12 module.

(a.2) Ultrasonic sensor

To recognize our closeness or presence, we'll need a sensor, which will operate as a trigger or touchless switch for this system. We have two options here: either an IR sensor module or an Ultrasonic sensor module. We can use an IR sensor module, which is a relatively inexpensive and efficient alternative but can be incorrect at times, or we can use an HC-SR04 Ultrasonic sensor, which is quite accurate above a 2 cm range but is slightly more expensive. (a.3) Mini pump servo/motor

We will require a pump or a motor to convert an electrical signal to the mechanical displacement of alcohol-based hand rub or sanitizer via the dispenser for motion or processing the output. The ideal choice

would depend on the scenario of usage and environment.

(a.4) Plastic Container

A container to store every primary and secondary component in order and on a stable platform.

(a.5) Pc/Server

For communicating / receiving data from the NodeMCU for further evaluation or modelling.

(b) Software

(b.1) Arduino IDE

It's used to write and upload programs to Arduino-compatible boards, as well as other vendor development boards with the support of third-party cores. The Arduino IDE has specific code structuring guidelines to accommodate the languages C and C++ [6].

(b.2) Node.js

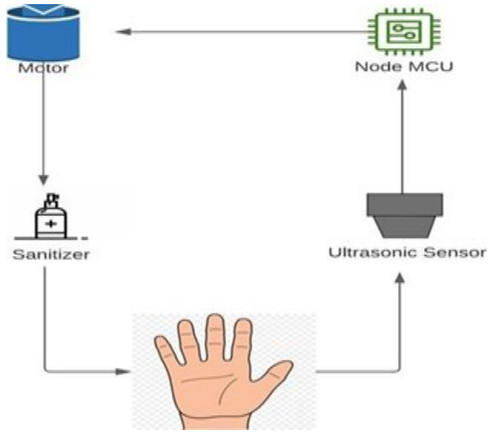
Node.js is a cross-platform, open- source back-end JavaScript runtime environment that uses the V8 engine to execute JavaScript code outside of a web browser.Node.js allows developers to utilize JavaScript to create command-line tools and server-side scripting, which involves running scripts on the server before sending the page to the user's browser. As a result, Node.js symbolizes a "JavaScript everywhere" paradigm, bringing online application development together around a single programming language rather than separate languages for server-side and client-side scripts [7].

(b.3) React

React is a front-end JavaScript library for creating user interfaces and UI components that is open-source. React can be used to build single-page or mobile applications as a foundation.

Process summary

Whenever the ultrasonic sensor detects a hand, it will pass a value to the node MCU, which will, in turn, trigger the motor to pump out the hand sanitizer. Simultaneously, NodeMCU is counting the number of pumps triggered and sending the relevant data to the server/PC for the administrator/client to assess. The data is sent through the local network for easy access and assessment by the client, though the client could configure or change it whenever he/she wants. Below we have given a diagrammatic representation of our process.



Website design and structure

The website includes all the features necessary for easy access for the administrator and client. The website fetches real-time data from the NodeMCU [9]. The incoming data will be filtered and sent to each building's component, which will then be plotted as graphs and charts. The website will have a dashboard that can be accessed by the admin to get an overview of the statistics in different buildings and also the overall statistics. For example, the average usage from the buildings combined and the average health and sanity index, which is calculated by the number of pumps against the number of students in that building. While each building will have several of these dispensers, it's critical to keep track of the liquid on board before it runs out, and to follow a standard method for notifying the administrator if it happens. Coming to each building, the admin can see the amount of liquid left through the charts and the color-coding schemes, which display green if there is a greater amount of liquid remaining, while yellow shows just about 25% or less liquid. And red, showing 0% of the liquid being completely used up and needing an immediate refill. All this can be viewed on

the overview tab, while specific statistics can be viewed using individual building tabs, which include average pumps for each dispenser and refilling data. Overall, this website helps to keep track of the sanitizing liquid and maintain hygiene around the campus. Here we have explained the website design in the context of how it is going to look and function when concerned with universities. Similar idea is going to be applied for other places as well. In the figure (2) below, one can see how our website is going to look.

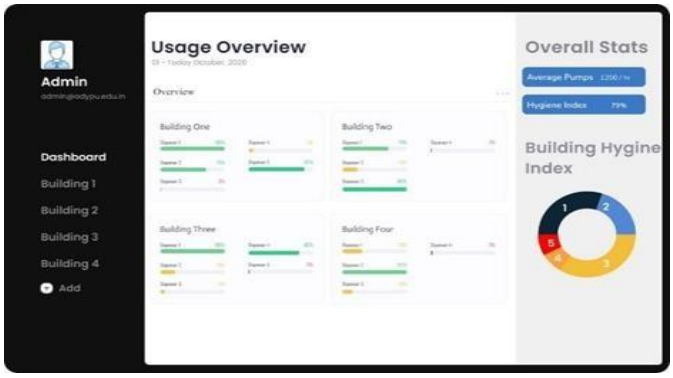


Fig (2). Website

III. CONCLUSION

In this paper, we propose a system that effectively counters the ever- going need for sanitizer refuelling, which is tedious and based on a raw guess or assumption. The usage of sophisticated systems like IOT changes the whole scenario of the task. The process uses some clever engineering techniques to tackle the problems faced by many large institutes or organizations trying to control the spread of diseases or maintain hygiene in crowded or hazardous areas. The first things that came to mind when we received this problem statement were evaluating efficiency and reducing human interference. This implementation can reduce a lot of tedious work from the authorities as they would have to just keep checking a website hosted locally and, depending on the level remaining, they can plan their refuelling. This would not only lead to better management by the authorities but also a better experience for the client since the chances of a dispenser with no sanitizer would be reduced to close to zero. This simple approach doesn't require any complicated gear or equipment. The IOT-based hand sanitizer will be extended in various directions. Firstly, we are planning to expand the system with various data analytic approaches that could be custom tuned for each organization/institute, which could help pre-determine sudden spikes in usage or warehouse essential products to meet the demand or just get the job done. The addition of Progressive Web Apps (PWA) [10] is also planned, which could be installed on any machine that is capable of running a browser for wider market penetration. We look forward to continuing to develop and perfect our system to meet various demands when needed.

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Cite this article as :

Rudra Dutt, Akshat Srivastava, Tarun Aditya Kusupati, Basab Nath, Chandrashekhar Kumbhar, "IoT Based Hand Sanitizer", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 8 Issue 4, pp. 331-336, July-August 2022. Available at doi : https://doi.org/10.32628/CSEIT228453
Journal URL : https://ijsrcseit.com/CSEIT228453