Research Article

Smart Sanitizer Disperser with Level Monitoring

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Abstract:
A smart sanitizer is an automatic sanitizer dispensing machine with no physical contact. It is an alcohol-based hand sanitizer which can be used in schools, hospitals, work places, offices and much more. In this alcohol is basically a solvent and not only a solvent it is also a very good disinfectant which is very much required in this current pandemic, as alcohol is volatile so it will vaporise instantly after application to hands. It is also proven and well known that above 70% of alcohol can kill Coronavirus in hands. In this we are using IR sensor to sense the hand placed near the bottle, esp32 as microcontroller which sense the distance and the result is the pump running to pump out the hand sanitizer. Ultrasonic sensor for the sensing the level of percentage that present in the bottle, the esp32 will sense the distance and the result is to send the alert when the percent of sanitizer in the bottle is less than the threshold, esp32 has the inbuilt network connectivity like WIFI module or Bluetooth module which is used to transfer the data from the esp32 to cloud. The data from the esp32 is analysed and the required alert are given

Key words: Arduino, Ultrasonic Sensor, ESP8266, DC Motor, Power Supply.

Introduction

Sanitization is cleaning or sterilizing an object or body part like hands or total body. It can be done by many ways like UV sanitization, soap sanitization, alcohol sanitization, bleach sanitization… from the above methods alcohol-based sanitizer is found more useful for us as it kills viruses, bacteria and also removes dirt from our hands and more even it is not harmful to our skin as it vaporizes easily. Alcohol might be expensive for mass scale sanitization of buildings or rooms and a major disadvantage is that alcohol is highly inflammable and requires careful storage to avoid catastrophe. It also makes hands dry since it absorbs moisture and hence also need the addition of the moisturizers. This sanitizer also provides with antiseptic, disinfectants because it is made up of alcohol. Minimum percentage of the alcohol required is above 70% which has ability to kill Coronavirus. But with physical contact of the sanitizer bottle there is a problem which may leads to the communication spread of COVID – 19 which is risky. So, in this we are making the non-contact-based hand sanitizer dispenser. Now a days many offices are superstructure buildings and occupy a large workforce and even in the colleges. In order to keep everyone safe we need to provide the sanitizer for everyone in the office or college or even in the public places. In order to fulfil the sanitizer requirement a number of dispensers are placed throughout the building. To manage the sanitizer in smart way. In this project main concentration is to manage the sanitizer levels. The system monitors the sanitizer dispensers by ultrasonic sensors placed over the dispensers and compare the level with threshold volume of the dispensers and then information about the level of sanitizer left in the bottle using the mobile application and iot platform dashboards to administrator. The main goal of the proposed system is to monitor the sanitizer levels and to manage overall dispensers. It will provide faster easier and cost effective way to manage the level of the sanitizers. It also includes the design of monitoring system with advantages of low cost and accuracy.

Literature Survey

[1] Water Level Monitoring System in Water Dispensers using IoT. IRJET, Volume: 05 Issue 04, Apr-2018 In this paper the water level monitoring was done by using ultrasonic sensors and Arduino as microcontroller, the ultrasonic sensor is placed on the top of the dispenser and the ultrasonic sensor check for the level of the water present in the dispenser and if the level of the water is less than the threshold value then the ultrasonic sensor send the data to the Arduino and the data from the Arduino is sent to cloud, and the cloud stores the data and then it will send the data to the respective user using the mobile application.

[2] IoT Based Water Level Monitoring System Using Nodemcu. Proceedings of the 11th Symposium on Applied Science, Business & Industrial Research-2019 In this paper the water level monitoring was done by using Arduino and ultrasonic sensors, whereas Arduino is used as the microcontroller and the ultrasonic sensors are placed over the top of the dispenser and they calculated the volume of the dispenser and the ultrasonic sensor check for the minimum threshold values like in this paper the there are different values for different thresholds like for bottom level is low and for middle level is medium and the ultrasonic sensors will send the data to the Arduino and the Arduino send the data to the website which is used by the administrator.

[3] Smart Water Monitoring System using IoT. IRJET, Volume: 05 Issue: 10, Oct 2018. In this paper the water level monitoring was done by using Arduino as microcontroller and used esp8266 WIFI module for the network connection between the Arduino and the cloud and used ultrasonic sensors and flow sensors for the level monitoring in this the ultrasonic sensor will check the distance and if the distance is more than the threshold value then the values are send to the Arduino and flow sensor is used to sense whether there is moment in the water to detect the presence of the water the flow sensor is used and the reading from this sensors are sent to the Arduino and the Arduino with help of esp8266 WIFI module the data from the Arduino is sent to cloud and the cloud will analyse the readings which is done by the think speak an iot platform and the data from the cloud is sent to the respective administrator.

Proposed Method

Smart sanitizer helps in preventing of spreading of covid-19 by the process of eliminating people from by touching the sanitizer due which there might be a minor impact in the process to reduce the covid transmission among the people. We are also building a app which provides real time analysis of the amount of sanitizer left in the bottle which provides user info about the time when it need to be refilled again and we are also trying for a alert system when the liquid quantity is less than 15% it gives an alert notification via a email or a message or we can as a feature in the app section so that we can have real time process of the sanitizer and can also provide an auto stock delivery option linking directly to the company.

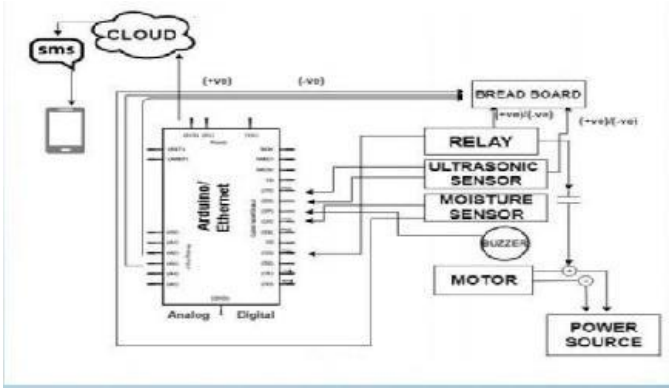

Figure 1: Model Circuit Diagram.

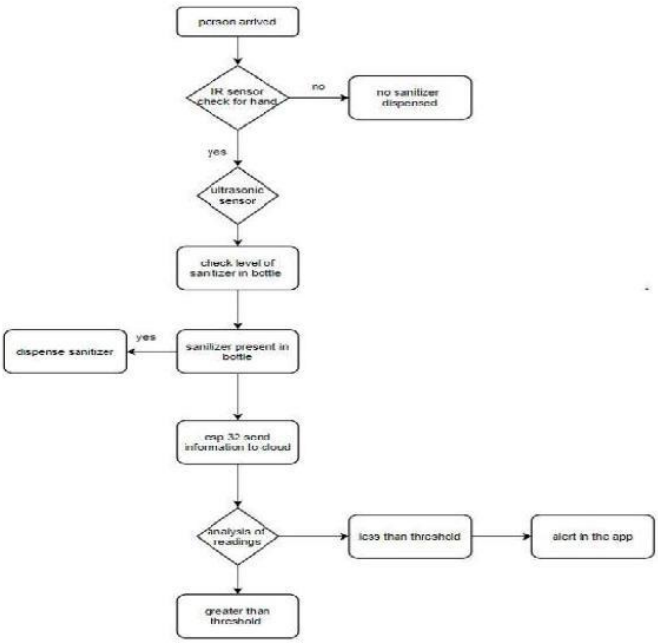

Figure 2: Flow Chart.

Block Diagram

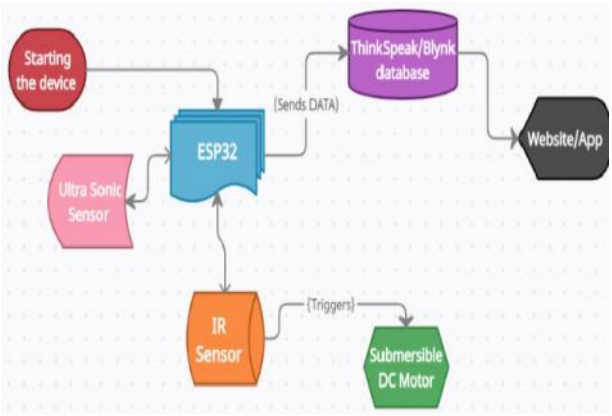

Figure 3: Block Diagram.

Hardware Description

1. Node MCU

Figure 4

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits. It is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module.

Later, support for the ESP32 32-bit MCU was added.

2. Arduino Board

Arduino is an open-source hardware and software company used for building electronics projects. Arduino board uses a variety of microprocessors and microcontrollers. The Arduino board is the collection of digital and analog input- output pins. Arduino Uno is the most popular board in the Arduino family. Uno means one in Italian and was chosen to mark the release Arduino software (IDE).

3. Ultrasonic Sensor

The Ultrasonic Sensor is utilized to quantify distance with high precision and stable readings. It can gauge distance from 2cm to 400cm or from 1 inch to 13 feet. It radiates an ultrasound wave at the frequency of 40KHz in the air and if the object comes in its way then it will bounce back to the sensor. By utilizing that time which it takes to strike the item and return, you can calculate the separation. The ultrasonic sensor has four pins. Two are VCC and GND which will be connected with the 5V and the GND of the Arduino while the other two pins are Trig and Echo pins which will be connected with any advanced pins of the Arduino. The trig pin will impart the signal and the Echo pin will be utilized to get the signal. To create an ultrasound signal, you should make the Trig pin high for about 10us which will send an 8 cycle sonic burst at the speed of sound, and in the wake of striking the item, it will be received by the Echo pin.

Figure 5: UV Sensor.

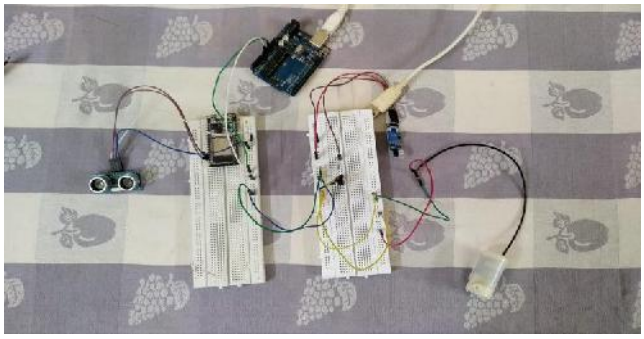

Figure 6: Hardware Model.

Software Description

For the hardware testing part we use Arduino IDE, in the code we specify the size of the container for getting the distance between the liquid surface and the sensor and the data is displayed on the serial monitor. We could even add a LCD display to it. Later we moved to IOT part which is sharing the data on a platform which can later be used for analysis and it requires internet connection which is achieve by Wi- Fi module present in ESP 32.

For this purpose, we chose Thinkerspeak as it has MATLAB in it for analysis. We achieve it by using Wi-Fi library and API key.

For a more flexible need we moved to Blynk app which works by saving our data to its data centre and then it can be access based on the subscription model. For this to achieve we use the Blynk library and API keys. The result can be see though an App which is customizable.

Result

While use Thinkspeak to see the result on the website it gave a 15 sec delay between each data input and with an accuracy of 98 percent. The lost in accuracy is due to the disturbance caused by the submersible DC motor. After a period of time the data was feed to an MATLAB algorithm which choses the best time to refill the sanitizer container and increase the efficiency of the motor. It turns out to for a container of diameter 4 cm and height 17 cm the best time to refill is at 17 percent.

When using Blynk platform, the delay in data injection was 2 secs and the accuracy was 97 percent which can be the result of low latency combine with the vibration caused by the DC motor

Conclusions

We made a device which dispenses sanitizer or in some cases soap solution without any contact and the level of the liquid is monitored and send to cloud continually and is being monitoring. While making this project we encountered many problems, it made us think in different ways and which expanded or critical thinking and increasing our knowledge about the subject. The advancement and popularity of IOT has made remote monitoring and data analysis easy.

We can easily find the most efficient time to refill the sanitizer container along with continuous monitoring. The pandemic has given the world new problems to face so we have to come up with new solutions even if it's just a small step towards solving it, that is how the technology grows.

The device is able to dispense sanitizer without contact with the help of motor which can be operated at low as 5V.The system can be used in rural places such as government hospitals and schools which can help in sanitation and over all improving people's health.

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