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Automatic Contactless Sanitization Unit

[1]Sukte Sandip Prakash, [2]Yadav Ajay Jagannath, [3]Pillay Sushil Govardhan, [4]Kardile Rishabh Madhukar, [5]Dr. Girish Allampallewar

[1][2][3][4][5] Department of Mechanical Engineering, Marathwada Mitra Mandal's Institute of Technology, Pune, India

***Abstract---* COVID pandemic has influenced human life in various sectors. Various attempts were made to reduce the virus transferring by work from home, social distancing, and also including hand hygiene. So far, most of the available hand sanitizers do not operate automatically. We aim to make an automatic hand sanitizer where soap and water can come out automatically.. The infrared (IR) will sense the presence of heat and motion of the object with the distance up to 50mm. It sends data to the Arduino UNO to activate the pump. If the IR sensor detects the distance of water to, he sensor 35 cm it will send data to node MCU that connect to Blink server. It can transfer the data to the output devices. The results of the hand sanitizer testing that the system can run smoothly with a minimum detection error of transferring data.**

***Index Terms*— Automatic Unit, Aurdino UNO, Contactless**

I. INTRODUCTION

In early 2020, a virus emerged that was spreading rapidly to several countries. The first case related to the virus was reported in Wuhan, Hubei Province [1]. WHO named this disease the 2019 novel coronavirus (2019-nCoV), then changed its name to Coronavirus Disease (COVID-19) which was caused by the virus of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-Cov-2).

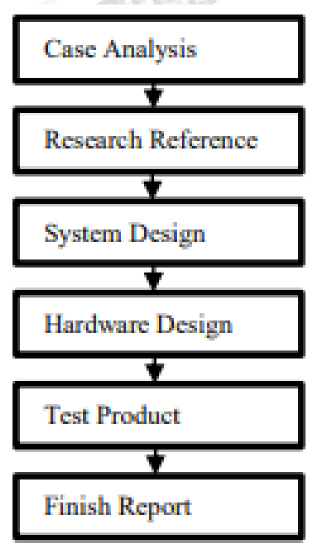
This virus is zoonotic (a virus that is transmitted between animals and humans) and originates from bats. Besides, this virus can also be transmitted from humans to humans. Coronavirus can be transmitted either by air, direct contact, or indirectly. However, it is most commonly spread by droplets. Symptoms caused by this virus include the mild flu, namely a cold, sore throat, cough, fever, and difficulty breathing. In severe cases, Covid-19 can manifest as pneumonia. Patients can develop acute respiratory distress syndrome for a short time and die from multiple organ failure.

The existence of this disease has a big impact on both socials and economics. WHO has declared this a pandemic disease and many cities around the world are in a lockdown situation. To prevent the cause of this virus, it can be done by keeping a distance at least 1 meter, avoid going to crowded places, avoid touching the eyes, mouth, and nose when outside, and cleaning hands with soap or alcohol-based hand rub.

Providing containers for cleaning fluids in public spaces is a form of Covid-19 prevention, but the provision of containers is currently ineffective because there are parts that are often touched. This could be a point of transmission for Covid-19. Many health actions are carried out using automatic systems including air quality monitoring, hand sanitizers, hand hygiene. Hand sanitizers are an alternative for washing hands during a pandemic. It can be used when and water are not available. Hand sanitizer is also available in several forms such as liquid (spray) or gel. Hand sanitizer is usually made from materials such as alcohol, polyacrylic acid, glycerin

II. METHODOLOGY OF WORKING PROCESS

Several steps were carried out in this research to test the Automatic hand sanitizer container has shown in Figure.1. Due to the spread of Covid disease, first we analyses the importance of environment needed for automatic hand sanitizer. The second step we make the literature study about the related article. We design the hardware, examine the result



III. CALCULATION FOR SELECTION OF PUMP

Data
1. Static head of suction (hs) = 1m
2.Length of suction pipe (Ls) = 3m
3. Length of delivery pipec(Ld) = 2m
4. Static discharge head (hd) = 0.5m
5. Discharge = 2lpm

Step – 1
$Q_{act} = 2lpm = 2 \times 10^{-3}/60 = 3.33 \times 10^{-5}\ m^3/sec$
Volumetric efficiency for CP = 95%
$\eta_v = Q_{act}/Q_{th}$
$0.95 = 3.33 \times 10^{-5}/Q_{th}$
$\mathbf{Q_{th} = 3.505 \times 10^{-5}\ m^3/s}$

Step – 2 Design of pipe diameter
$Q_{th} = A_s V_s$
$N_s = 1+3$ m/s
$V_s = 2$m/s
$3.33\times10^{-5} = \pi/4\times ds^2\times2$
$\mathbf{ds = 4.723\times10^{-3}m}$
$Q_{th} = A_d \times V_d$
$V_d = 1\text{-}3$m/s
$3.33\times10^{-5} = \pi/4\times d_d\times3$
$\mathbf{D_d = 3.856\times10^{-3}m}$

Step – 3 Calculation of manomatric head
$H_m = h_s+h_d+h_{fs}+h_{fd}+(V_d^2/2g)$
$H_{fs} = 4fl_sV_s^2/d_s2g$
f = 0.04\
$4\times0.04\times3\times2^2/4.723\times10^{-3}\times2\times9.81$
$h_{fs} = 20.71$m
$h_{fs} = 4f\ L_d\ V_d^2/d_d \times 2g$
$= 4\times0.04\times2\times3^2/3.856\times10^{-3}\times2\times9.81$
$h_{fs} = 38.06$m
$H_m = 1+0.5+20.71+38.06+(3^2/2\times9.81)$
$\mathbf{H_m = 60.72m}$

Step – Selection of Motor
Power = Water power/overall efficiency
Overall efficiency = $\eta_m\times\eta_v\times\eta_{man}$
$\eta_m = 95\%$ $\eta_v = 95\%$ $\eta_{mano} = 0.75$
Overall efficiency = 0.95×0.95×0.75
$\eta_o = 0.6768$
Water power = $\rho\ g\ Q_{act}\ H_m = 1000\times9.80\times3.33\times10^{-5}\times60.72$
Water power = p = 19.83/0.6768 = 29.29watt
Motor Speed (N)
$N_{min} = 10\ H_m^{3/4}/\sqrt{3.33\times10^{-5}}$
$\mathbf{N_{min} = 37694.38rpm}$

Type of CP Selection
$N_s = N\times\sqrt{Q_{act}}/H_m^{3/4} = 37694.38\times\sqrt{3.33\times10^{-5}}/60.72^{3/4}$
$\mathbf{N_s = 10.004}$
$\mathbf{N_s}$ = 10-30 low speed radial flow type CP

MAIN COMPONENTS

A. PUMP

Water pump motor DC 2V/370-04PM has a 12V motor and a tough thermoplastic body, it is widely used for water priming pump, automotive pump experiment pump bonsai rockery, DIY projects and so on.

B. SOLENOID

Solenoids are basically electromagnets: they are made of a big coil of copper wire with an armature (a slug of metal) in the middle. When the coil is energized, the slug is pulled into the center of the coil.This makes the solenoid able to pull (from one end) or push (from the other)

C. AURDINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing

D. BATTERY

We are using a 12v / 1.3 Ah Rechargeable battery to powe our unit which will be capable of running our all electronics such as Aurdino board, pumps and sensors etc

E. IR SENSOR

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received

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IV. WORKING OF SENSORS

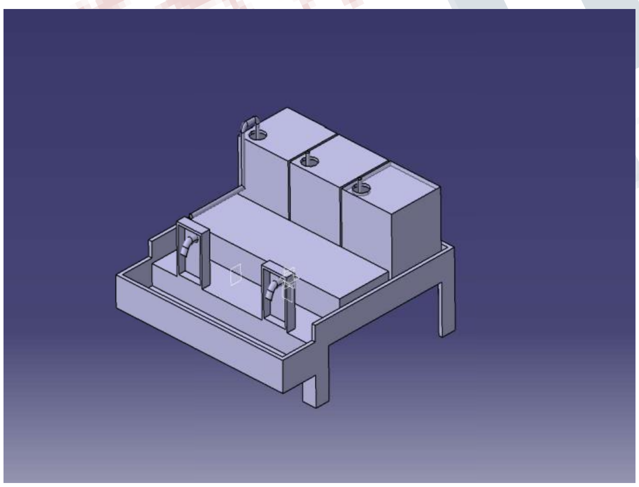
For Sanitizer Dispenser

Here, we use an IR sensor, Servo motor and Arduino Uno board. You can use any micro controller. When we place our hand in front of the Distance sensor, it will help the Arduino to measure the distance from the sensor to object in the desired range, Arduino will write the servo to 180. User will show hands in front of the first tap if he wants to sanitize his hands only by sanitizer. IR sensor will get active and by using microcontroller and send info to turn on motor for determined time to dispense sanitizer liquid from tank by using water pump.

For Soap Dispenser

If user wants to use soap and water at time when IR two will get activate then first motor form tank 2 will get on for few seconds and dispense soap liquid drops from tap by using solenoid coil. User have to rub their hand for 20 seconds and after 20 second buzz will get on and notify to user that water will come from tap 2 and by using tank 3 motor to wash hands by water. In this way we will be forcing user to thoroughly wash and rub their hand for 20 seconds as advised by the WHO (World health organization) to eliminate the changes of spread of any viruses

V. CONCEPTUAL CATIA 3D MODEL



VI. ADVANTAGES

1. Two modes of sanitization with sanitizer dispenser and with Soap and water
2. Forcing user to use soap as well as rub their hands for 20 seconds as guided by the WHO
3. Automatic Contact less working to avoid physical contact and help prevent transfer of germs
4. Less use of sanitizer liquid giving the same effect by spraying in mist form

VII. CONCLUSION

Hand sanitizers usually operate by squirting sanitizer liquid when one presses a pump with one's hand. Some hand sanitizers on the market are automatically pumped. However, sanitizer containers and pump devices are designed to be compatible only between products produced by the same manufacturer. To address this problem, we have designed an automatic hand sanitizer system that is compatible with various containers. With the proposed device, it is possible to avoid many people coming into contact with the pump handle, thus preventing fomite viral transmission and making the use of hand sanitizer much more convenient. Moreover, the system squirts a certain amount of hand sanitizer at all times, making it easy to manage refills and replacement. Furthermore, it can operate compatibly with various designs of sanitizer containers, so consumers do not need repurchase a container for the liquid if they replace the hand sanitizer. Thus, it is economical and eco-friendly by decreasing waste emissions. The automatic hand sanitizer device proposed by this paper is ultimately expected to contribute to contactless hand disinfection in public places and virus infection prevention.

REFERENCES

[1] Ing-K L, Chih-C W, et al February 2020 Effective Strategies to Prevent Coronavirus Disease2019 (Covid-19) Outbreak in Hospital Journal of HospitalInfection

[2] World Health Organization 2020 Naming the Coronavirus Disease (COVID-19) and The Virus that Causes it (Internet) World Health Organization Available on https://www.who.int/emergencies/diseases/novel - coronavirus-2019/technicalguidance/namingthe-coronavirus-disease-(COVID-2019)-and-thevirus-that-causes-it

[3] Zakir K, Khayal M, Ali A, Hazir R March 2020 Coronavirus Outbreaks: Prevention and Management Recommendations, Drugs & TherapyPerspectives

[4] Adityo S, G Martin R, et al March 2020 Coronavirus Disease 2019: Review of Current Literatures, JurnalPenyakitDalam Indonesia7.

[5] Yan-R G, Qing-D C, et al 2020 The Origin, Transmission, and Clinical Therapies on Coronavirus Disease 2019 (Covid-19) Outbreak. An Update on The Status, Military Medical Research7

[6] World Health Organization 2020 Naming the Coronavirus Disease (COVID-19) and The Virus that Causes it (Internet) World Health Organization
[7] “Construction and Application of an Intelligent Air Quality Monitoring System for Healthcare Environment,” 2014, DOI: 10.1007/s10916-014-0015-3.
[8] T. S. Hong et al., “Systems-Level Quality Improvement A Hand Hygiene Compliance Check System: Brief Communication on a System to Improve Hand Hygiene Compliance in Hospitals and Reduce Infection,” 2015, DOI:10.1007/s10916-015-0253-z
[9] E Tartari et al., “Train-the-Trainers in hand hygiene: a standardized approach toguide education in infection prevention andcontrol,” Marathwada Mitra Mandal’s Institute of Technology, B.E. (Mechanical) 31 [10] S. Angelina et al., “Infection Prevention in Practice Assessing the Hawthorne effect onhand hygiene compliance in an intensive care unit,” vol. 2, pp. 10–13, 2020, DOI: 10.1016/j.infpip.2020.100049.
[10] D. J. Birnbach, T. C. Thiesen, L. F. Rosen, M. F. Msn, and K. L. Arheart, “Major ArticleA new approach to infection prevention: A pilot study to evaluate a hand hygiene ambassador program in hospitals and clinics,” AJIC Am. J. Infect. Control, vol. 0, pp. 3–5, 2019, DOI: 10.1016/j.ajic.2019.11.007.

