International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 07 | July - 2022 Impact Factor: 7.185 ISSN: 2582-3930

Smart Sanitizing Robot with Medicine Transport System for Covid-19

Dipali K. Bansod, Tarannum U. Pathan

Students , Department of Electronics and communication Engineering, Priyadarshni Bhagwati*College of Engineering , Nagpur, Maharashtra, India*
Professor, Department of Electronics and communication Engineering , Priyadarshni Bhagwati*College of Engineering, Nagpur, Maharashtra, India*

Abstract-

As the cases of pandemic are increasing gradually, we need to contribute in the present situation with our small act. Through this project, we will make a sanitizer robot which can spray sanitizer on patients wards and also provide medicine facility them. This project will be embedded based to control the wireless sanitizer spraying robot with Smartphone. In addition, there will be a holding plate on the robot so that the Doctors can send the medicines or other important things to their patients without even entering into the covid ward. We are also going to charge the robot's battery with solar panels add a gist of renewable energy in our robot's power. At the end, we want that our robot to work both out of the quarters and inside them.

Keywords: Covid -19 , Sanitizer spray , Arduino Uno , Smartphone Function etc.

1. Introduction

Engineering solutions would have taken effect especially early during an outbreak, before measures like lockdowns were introduced. But even during lockdown, they can help reduce the spread of the virus to parts of society that are still open, such as banks and supermarkets.

COVID-19, the disease caused by the novel coronavirus, has led to a global lockdown the likes of which have not been seen in over a century. Responses in hot spots have varied from recommended social distancing to mandatory self-isolation. While the public does its best to heed these instructions, critical workers such as first responders, nurses and doctors, transit workers, grocery store workers and others remain at their jobs.

We are getting used to seeing robots in our lives, performing everyday tasks from scanning store shelves to clearing our homes. But during a crisis like the COVID pandemic, we are seeing that these tools can help keep people safe by reducing our exposure to the virus and helping to reduce the spread.

One group that is being heavily relied upon during this time of crisis is the group of people tasked with disinfecting contaminated areas, putting them at potential risk. To reduce human contact in these affected indoor and open-air areas, cleaning robots are being built..

The objective of this research project is to design and implement a low cost smart wireless controlling sanitizer spraying robot with medical transport facility based on Arduino Uno (microcontroller), high speed DC pump bluetooth module, sanitizer tank, medicine box, to meet the challenges in this pandemic. can help solve. Situation. It can be used in corona patient ward, where normal person is not allowed. In such a situation, this robot will help.

Instead of manual disinfection, which requires mobilization of the workforce and increases exposure risk to sanitation workers, autonomous or remote-controlled disinfection robots could lead to cost-effective, fast and effective disinfection.

“Coronavirus can be an incentive to create mechanical structures that can be quickly conveyed by experts and fundamentally specialist organizations with remote access without the need to travel to the forefront.

The effectiveness of the country and the world's responses to the challenges posed by the COVID-19 pandemic, and the recovery of both our economy and social well-being, will depend on the talents of scientists, engineers and medical professionals. Together, we will be successful.

2. Problem Statement

- COVID-19, the disease caused by the novel coronavirus, has led to a global lockdown the likes of which have not been seen in over a century. Responses in hot spots have varied from recommended social distancing to mandatory self-isolation.
- We are getting used to seeing robots in our lives, doing daily tasks from scanning store shelves to vacuuming our homes. But during a crisis like the COVID pandemic, we are seeing that these tools can help keep people safe by reducing our exposure to the virus and helping to reduce the spread.
- "Covid-19 can be a catalyst for developing robotic systems that can be rapidly dismantled, without the need for

remote assistance by experts and essential service providers.

3. Objective

- The main objective of this project is to design a smart sanitizing robot for the COVID-19 situation and save the lives of our frontline warriors.
- Sanitizing infected area with wireless function
- To transport medicine, food or anything needed in the patient area
- To study mobile communication and its control
- To study the controller required for this project and its development features.

4. Literature Review

In recent years, there has been an increase in the availability and use of hand sanitizing products. The main advantage of these projects seems to be that they are more reliable, faster and easier to use. They can also provide another way to clean hands when water and soap are not available. The use of hand sanitizer is generally considered to be an effective hand hygiene system for hospitals, health care settings and more. As we all know, the outbreak of COVID-19 affected the world and changed our lifestyle. In this situation, alcohol and hand sanitizer are important fluids, however, they must be used properly. Touching an alcohol container or hand sanitizer with infected hands can spread the virus to the next person. In this examination paper, we will plan and execute a savvy hand sanitizer gadget that utilizes a ultrasonic sensor to recognize the presence of the hand, actuates the main servo engine to pour fluid onto the hand, enacts the electromagnetic lock to d - Energizes and promptly conveys message to the subsequent servo engine to open the entry.

- ***Jessica Hilburn, April 2003***. The paper primarily deals with hospital infections, which account for about 2 million patients per year and also states that it is the 8th leading cause of death annually in the United States. It also states that hand washing is important and effective with proper hand washing steps, but washing with soap and water for peak hours in hospitals is time-consuming. This paper also showed the effectiveness of alcohol-based hand sanitizers, reducing infection rates by 30%. They used hand sanitizers containing 60 to 70 percent ethanol or isopropanol to reduce significant numbers of pathogens. Patients were also given about 4.25-ounce containers of hand sanitizer along with their beds. Showing a result for a 10-month period of using hand sanitizer 36.1% reduction in infections.
- ***Satoru Mitsubishi, March2018***. This paper describes infections caused by drug-resistant microbes that cause increased mortality and complications, including multidrug resistant bacteria, methicillin-resistant Staphylococcus aureus (MRSA), extended-spectrum beta-lactamase (ESBL). Producing bacteria, include multidrug resistant. Pseudomonas aeruginosa (MDRP), which are very common around the world. As multidrug bacteria isolation rates are increasing in many antibiotics, even personal protective equipment (PPE) may not be effective in isolation rates of MSRAs. Therefore, they insist on the use of alcohol-based hand sanitizers as alcohol-based hand sanitizers had a negative correlation with MRSA isolation rates, which means that hand hygiene is very important in hospitals.
- ***Golin, AP Aug 2020***. In this paper about the emergence of Novel Coronavirus (SARS-CoV-2), which has caused unexpected challenges to the health of the people of this world, the paper also aims to reduce the transmission rate of the infection. Disease. The paper explains virus structure and how it differs from bacterial structure, meaning that single stranded or double stranded RNA or DNA in viruses is contained in a 'capsid' and viruses can only replicate in the presence of a host. and described as 'living entities. Bacteria have a nearly identical structure with a 'cell membrane' including DNA or RNA and can replicate without a host. The paper also gives a complete comparison between hand sanitizer and soap, foam versus gel, and states that higher concentrations of ethanol can reduce the amount of virus particles present in the hand and therefore prove the effectiveness of alcohol-based hand sanitizers. does.

5. Block Diagram

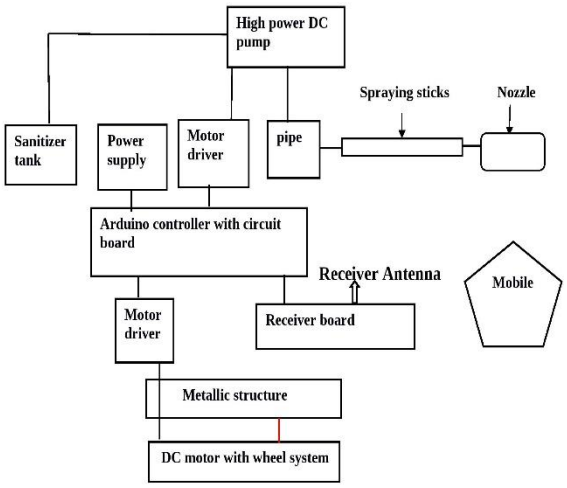


Fig. 1. Block Diagram

6. System Architecture

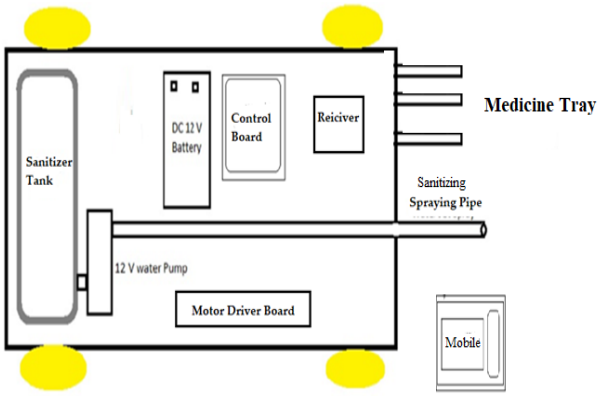


Fig. 2. System Architecture

7. Hardware Components

- Arduino Uno Controller (R3-ATmega 328)
- Bluetooth module (HC-05)
- DC pump (DC12V)
- 12V DC Power Supply,
- 5V DC Regulator (7805 IC)
- LCD display (16*2) (DC 5V)
- Relay (12V)
- Adapter (12v 2Amp)
- Battery (12v 1.5Amp)
- Tank (1 Lit)
- LEDs
- Resistors, Capacitors and Diodes
- Other

❑ Bluetooth module (HC-05)

The **HC-05** is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop.

❑ Arduino Uno

It is main controller belongs to Arduino family. which is used to control the signal received from any input voltage source like sensor and transmitter/receiver module. It is attached LCD display to show the command.

❑ Brushless DC Pump

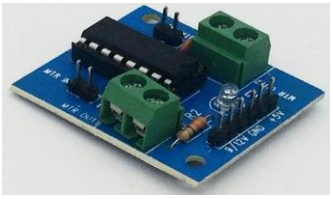
- Operates on 12V supply , The Speed Control circuit technology is able to stabilize the voltage changes and load changes, sanitizer flow is very stable.
- In particular, it is suitable for users who have the demand for a steady flow, the flow tolerance was <±10%.

❑ 12 v Battery

- 12 V , 1.3 Amp Battery is high power battery easily handle all the function.
- Main things are to collect electrical energy from solar panel and provide to various components For running specific function.

❑ Motor driver (l293d ic)

Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. Operates on 12 v power.

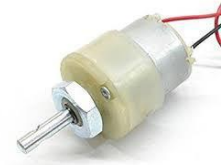


❑ Liquid crystal display

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs)
It is used to display all commands of robot.

❑ **DC Motor (operates on 12v , Speed :100 RPM)**

- The direct current (DC) motor is one of the first machines devised to convert electrical power into mechanical power.



❑ **Realy Board (12v)**

A relay is usually an electromechanical device that is actuated by an electrical current. The current flowing in one circuit causes the opening or closing of another circuit. 12v relay board. It is used to operate DC pump motor.

8. Software Used

Language : Embedded C
Platform : Arduino IDE 1.8.13(software)
Operating Mode : Window 10

9. Working

- The main goal of this project is to design a Smart sanitizing robot for Covid-19 condition, and save the life of our front line warriors. By using remote operation.
- This robot is loaded with a sanitizer tank and a High-speed pump controlled through wireless communication to sprinkle. For the desired operation, an Arduino microcontroller is used.
- At the transmitter end, push buttons are used to send commands to the receiver end to control the robotic movement, either in forward, backward, right or left and 360 direction movement.
- The remote control that has the benefit of adequate range up to 30 meters with apposite antenna, while the decoder decode before feeding it to another microcontroller to drive DC motors via motor driver IC for necessary work. .
- A sanitizer tank along with water pump and control board is mounted on the robot body and its operation is carried out from the microcontroller output through appropriate signal from the transmitting end.
- There is wireless camera attached at the front portion of robot. We can see the live footage of surroundings and spray according to it.
- Robot is powered with 12v battery, and it is charged with 12v adopter for uninterrupted of power.
- This robot also transports various medicine and medical equipment's inside the corona ward or any other location. This make robot a multifunction performer.

10. Research Methodology

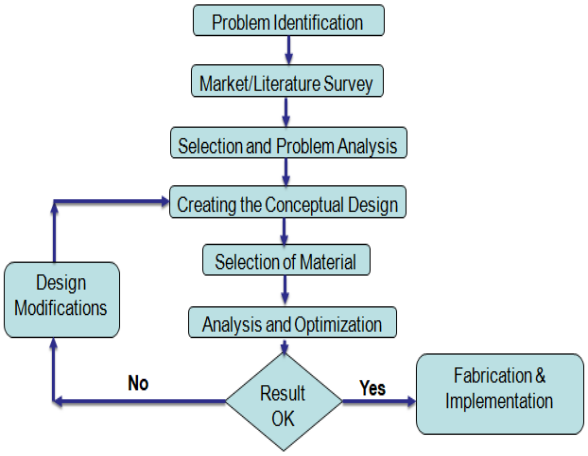


Fig. 3. Project Methodology

11. System flow diagram

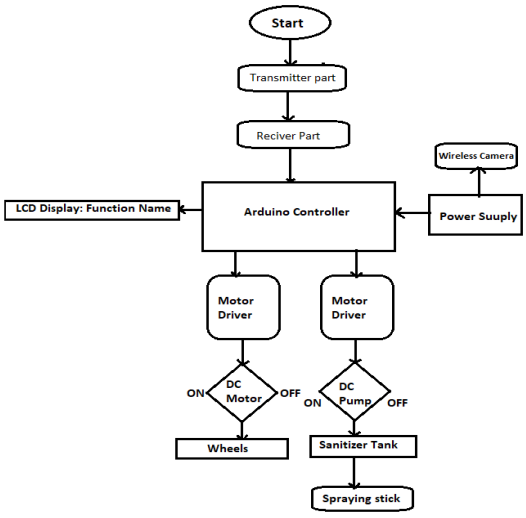


Fig.4. System flow diagram

12. Circuit diagram

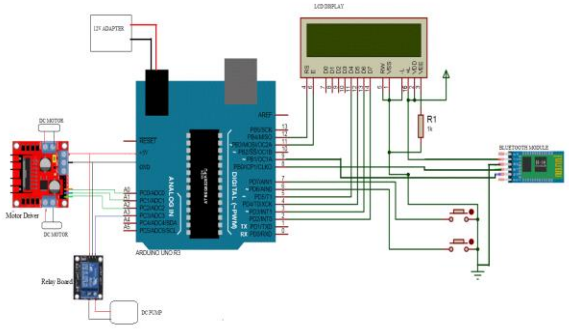


Fig.5. Circuit diagram

13. 3D model of Robot

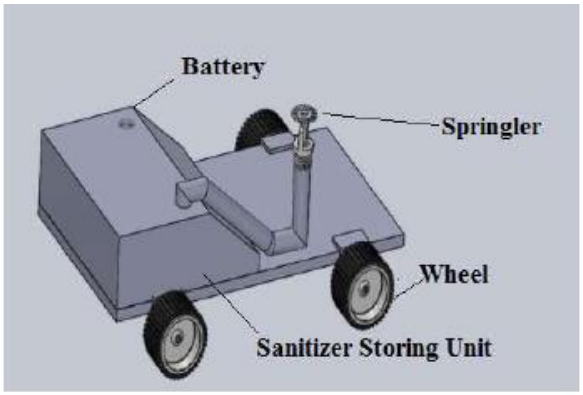


Fig.6. 3D Model of Robot

The robot is capable of effectively killing microorganisms on the floor, such as fungi, bacteria, and viruses, and has significant effects on harmful microorganisms. The robot cans automatically patrol for sterilization and disinfection in a predetermined area. The sprinkler is equipped with a double-acting pneumatic cylinder, and the purpose of the cylinder is used to pushes the air into the tank. The main components consist of a sprinkler robot, is DC motor, Bluetooth module, Arduino, Motor driver, Submergible pump, Sprinkler, Battery, DC Converters. The frame is made up of a 3mm Galvanized iron sheet with a dimension of 440 mm length and 240 mm width. The frame acts as a base and is used to assemble all the components.

14. Advantages

(i) It is Non contactable.
(ii) Protect from COVID 19.
(iii) Wireless technology.
(iv) Design is compact.
(v) Easy to operate and installation
(vi) Available in different sizes.
(vii) User friendly.
(viii) Maintenance is low.

15. Disadvantages

(i) Skill Person needed
(ii) Fire hazards

16. Applications

(i) It can be used hospitals.
(ii) Used in public locations
(iii) Also used in School & colleges
(iv) Use in Airports.
(v) Used in hotel and restaurants.
(vi) Shopping malls.
(vii) Banks.

17. Results and Discussion

Autonomous mobile sanitizing robot is becoming most useful in COVID-19 hospital environments. It reduces the human intervention in sanitization. The designed system is very compact, so easily can transport this robot to any place. The COVID-19 pandemic presents even more reason to use mobile robots for safe cleaning in quarantine zones. The proposed model is fabricated and tested in a hospital environment. The system is capable of disinfecting an area of up to 100 m2 per day. By using the autonomous sprinkler system optimizes the disinfecting areas and reduces the wastage of sanitizer. The designed system is capable of sanitizing an area of up to 100 m2 per day. The application area can include hospital corridors, medical shop, operation theatre, walking pathways, doctor room, testing center, and patient room, etc.

- ***Design Calculations***

(i) *Sprinkler flow rate*
Theoretical
$Q=k\sqrt{p}$
p=20 psi
k=5.6
$Q=5.6\sqrt{20}$
Q= 25 GPM
Q=Flow Rate (GPM), P=Operating PSI of head/Outlet
K=K Factor of Head/outlet

(ii) Analysis
For 1 litre, the flow rate of the Sprinkler is 476seconds.
For the project the flow rate of the sprinkler is 200 seconds.
The area of the sanitizer covered is 600mm.
The acquired Flow rate is 17GPM
(iii) *Motor Specifications*

Speed = 200 RPM,
Voltage = 12V,
Power = 100W
Torque of the motor
Torque = (P X 60) / (2 x 3.14 x N)
Torque = (100 X 60) / (2 x 3.14 x 100)
Torque = 9.554 Nm,
Torque =9.554 x 103 Nmm

(iv) *Battery life calculation*
Robot working hours for one full charge.
Batter capacity = 12v 7Ah (Ampere Hours)
Total device consumption = 520ma (mill ampere)
Battery Life = Battery Capacity in mAh / Load Current in mA
= 7000mAh/520ma
= 13.46 Hours

18. Conclusion

This project presents a smart sanitizing and transport robot using bluetooth communication and is designed and implemented with arduino controller (MCU) in embedded systems domain. The proposed method has been verified to be highly beneficial for COVID-19 situation or other pandemics. This presents a great opportunity for automation and will be useful in places human cannot reach or is dangerous. This can be used as a further extension of the project to get all the features. It is a low cost user friendly system which can be used by anyone. All devices communicate well. Here it can be concluded that the system has been implemented successfully and the target has been achieved without any deviations. The results achieved in this project are real and are the product of honesty and hard work.

19. Future scope

This project could be modified to increase the efficiency of the robot using solar energy and generation batteries. This could be further modified the improved surveillance using wireless camera. This robot could be able to compete directly with manual sanitizer sprayer.

References

[1] Jessica Hillburn MT(ASCP),CIC, Brian S Hammond, Elanor J Fendler PhD, Patricia A Groziak MS, "Use of alcohol hand sanitizer as an infection control strategy in acute care facility", American Journal of infection control Volume 31,Issue 2, April 2003.

[2] Satoru Mitsuboshi, Masami Tsugita, "Impact of alcohol-based hand sanitizers, antibiotic consumption, and other measures on detection rates of antibiotic resistant bacteria in rural Japanes hospitals", Journal of Infection and Chemotherapy, 2018.

[3] Golin, A. P., Choi, D., & Ghahary, A. "Hand Sanitizers: A Review of Ingredients, Mechanisms of Action, Modes of Delivery, and Efficacy Against Coronaviruses". American Journal of Infection Control ,2020.

[4] Davis MA, Sheng H, Newman J, Hancock DD, Hovde CJ. Comparison of a waterless hand-hygiene preparation and soap- and-water hand washing to reduce coliforms on hands in animal exhibit settings. Epidemiol Infect. 2006;134:1024–1028.

[5] Health impact of handwashing. WELL fact sheet 2006. at: http://www.lboro.ac.uk/well/resources/fact-sheets/fact-sheets htm/Handwashing.

[6] https://www.instructables.com/id/DIY-Easy-Non-Contact-Automatic-Hand-Sanitizer- Automatic-hand-sanitizer-disp

[7]https://www.theguardian.com/world/2020/feb/28/hand-sanitiser-or-hand-washing-which-more-effective-against- coronavirus-covid

[8] International Journal of Engineering Research & Technology (IJERT) Published by : ISSN: 2278-0181 http://www.ijert.orgVol. 9 Issue 07, July-2020

[9] International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 NCETESFT - 2020 Conference Proceedings

[10] ISO/IEC20922:2016.Informationtechnology-MessageQueuing Telemetry Transport (MQTT) v3.1.1, 2016.