

## AUTOMATIC DISINFECTING ROBOT

<sup>1</sup>G.KARTHIK REDDY, <sup>2</sup>K.SATHISH, <sup>3</sup>P.MAHESH BABU, <sup>4</sup>J.MOUNIKA, <sup>5</sup>DEVAKUMAR

<sup>1</sup>Assistant Professor, ECE Department,CMR College of Engineering & Technology

<sup>2</sup>Assistant.Professor, ECE Department,CMR College of Engineering & Technology

<sup>3</sup>Assistant Professor, MECH Department,CMR College of Engineering & Technology

<sup>4-5</sup>B-TECH,Dept.of CSE, CMR COLLEGE OF ENGINEERING & TECHNOLOGY

### Abstract

Because of the COVID-19 virus, human lives have changed extensively and the only way to minimize this is by maintaining social distancing and follow guidelines proposed by the government. Not to mention sanitization has become an important part of our daily life. Talking about sanitization and sterilization, there is a problem, we cant directly involve in the sterilization process, because there is a chance of getting affected by the virus and various disease causing pathogens from the contaminated places. But what we can do to solve this is problem is to build a powerful, efficient and autonomous robot, that can disinfect a place very easily without exposing ourselves. Robots are in use for several applications where humans can be at risk of exposure. So, we decided to develop a UV light disinfecting robot that will be able to kill harmful virus and pathogens in hospital wards, and other common contaminated places. We are going to use Arduino UNO, UV lights, and ultrasonic sensors This robot is an extension of the basic cleaning process. This device has three UV lights arranges on three sides along with ultrasonic sensors. Disinfecting process is done by UV lights. The UV lights used in this should be of wavelengths less than 290nm which has the ability to destroy pathogens. The ultrasonic used in this device is HC-SR04. This is used so that the robot detects if any obstacle comes in its way and changes its direction. This robot moves around with the help of wheels. Arduino UNO, L293D motor driver voltage regulator, batteries and jumper wires are also used in this device. All these are covered using foam sheets.

### 1. INTRODUCTION

Maintaining a good health in a healthy environment is what we all need in this pandemic situation and even after that. Sanitization has become a very important aspect in these times and plays very crucial role in preventing us from infectious

bacteria. Sanitizing the infected places or places where the infected people had been is indeed challenging and it requires very high precautions to be taken. But it will always be a risk. The main objective of this project is minimizing human contact as much as possible on cleaning process

and thus automating the tasks such as disinfecting surfaces with the help of robots. In this case, the use of robots can reduce human exposure to pathogens, which keeps human from getting infected. The project uses UV lights for disinfecting. UV light is a form of electromagnetic radiation with wavelength from 10nm to 400nm. It is shorter than that of visible light but longer than x-rays. Disinfecting is done by UV lights of wavelengths less than 290nm i.e.; UV-C(far) light. This type of lights is commonly used to kill microbes on surface, in air and in water. ultraviolet lights kill cells by damaging the DNA. This triggers the formation of certain material in DNA, which causes a dead cell. Among all other physical disinfecting methods UV light disinfecting robot is most effective way of disinfecting. As robots have many applications in the healthcare using them for disinfecting hospital wards, operating rooms, and other common surfaces is a great idea.

## **2. RELATED WORK**

Because of the corona virus, human lives and livelihoods change extensively and the only way to minimizing the spread of the virus is to maintain social distancing and follow guidelines proposed by our respective government. Not to mention sanitization and sterilization have become an indistinguishable part of our daily life.

Talking about sanitization and sterilization, there is a problem, we can't directly involve in the sterilization process, because there is a chance of getting the deadly virus from the contaminated space, but what we can do to solve this problem is to build a powerful, efficient, and autonomous robot, that can sterilize a place very easily without exposing ourselves. Robots are in use for several applications where humans can be at risk of exposure. So, we decided to build an ultraviolet sanitization robot that will be able to kill the virus in the hospital, schools and colleges and other public places \and for that, we are going to be using an Arduino, some UV LEDs, ultrasonic sensors, batteries, motors and build a robot that can automatically sanitize the surface.

## **3. IMPLEMENTATION**

As cleaning has become more important since the pandemic, there is a need to make a robot that can automatically sanitize the surface using UV lights and make sanitizing job easy instead of tiresome and harmful in case of contact with any bacteria or virus while cleaning.

The project seeks to follow the following steps:

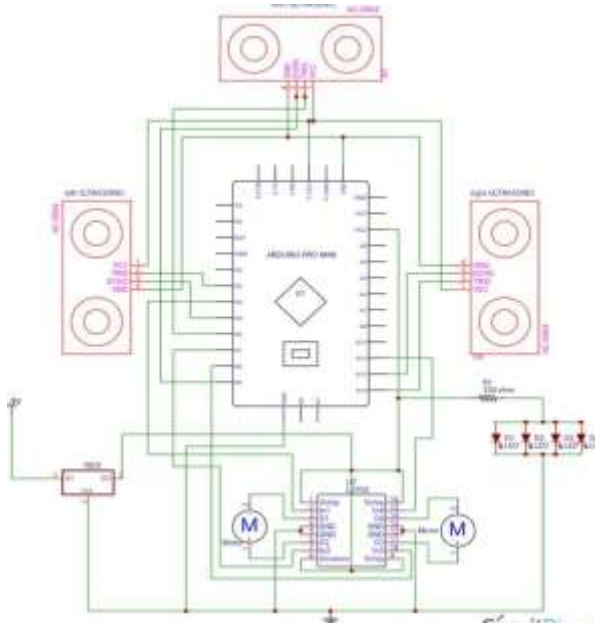
- To build a powerful and safe disinfecting robot, that can sterilize any surface.

- To design human independent robot.
- Making this device turn itself when in contact with any object.
- Designing a device which doesn't exposes ourselves in cleaning process.

This robot is completely automatic and it will detect obstacles and avoid those before a collision happen. there are many options to detect an obstacle, but for this project, we have chosen to do it with an ultrasonic sensor module because it has a lot more advantages over conventional IR based obstacle avoidance sensors, first is the range, it has a longer range compared to the range of an IR based proximity sensor. Second, like the IR sensor, sunlight doesn't interfere with the sensing capabilities of the sensor. The HC-SR04 ultrasonic distance sensor module has 4 pins VCC, Trigger, Echo, and Ground. It has one ultrasonic transmitter and one receiver. The working is very simple, first module transmits ultrasonic wave which travels through air, hits an obstacle, and bounce back that is when the receiver receives that wave. To measure the distance of an object, we need to calculate the time taken to bounce back the wave. We can calculate this time with the help of a microcontroller and with the help of this equation  $\text{Distance} = \text{speed of sound} * \text{time taken}$ , we can calculate the distance of the obstacle.

In this robot, we have two ultrasonic sensors for detecting obstacles on its way. When an obstacle comes in front of any sensor (at a certain distance) the robot will turn in to the opposite side and avoid that obstacle for example if an obstacle comes in front of the left sensor robot moves to the right. While the robot is powered ON, the UV LEDs will stay ON and the sterilization process will continue.

A UV disinfecting robot is an automated device. As it says disinfecting, this robot kills all the dangerous bacteria and germs on any surface. The sterilizing process is done by the UV lights that have the capability in destroying DNA of the pathogens and preventing them from reproducing. As Now-a-days as robots are being extensively used in all the fields where humans are at risk. So, this will be very much efficient method for sanitizing surface without exposing ourselves. It is also very reliable as it can work all day and night without getting tired unlike humans.



#### 4. EXPERIMENTAL RESULTS

The primary purpose of the robot is to disinfect a room or a flat surface using ultraviolet lights. The robot has ultraviolet LEDs which is responsible for killing the virus. Bio-organisms such as bacteria, viruses are known to be deactivated when exposed to UV light. Ultraviolet light destroys the genetic material in pathogens—DNA in bacteria and RNA in viruses thus preventing them from reproducing. Virus-like COVID-19 can remain active on surfaces for a long time, and UV light has been proven to destroy the RNA in viruses, thus killing it in the process, which reduces the chance of transmission.

##### Scope

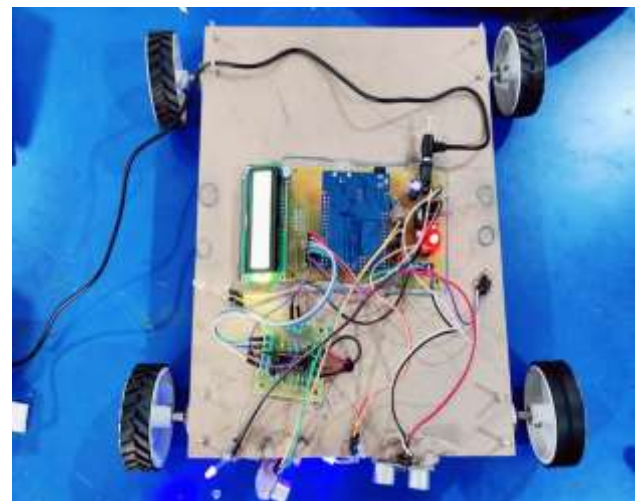
It can be used to disinfect hospital areas.

It can be used to sterilize contaminated places without exposing ourselves.

It can also be used at any other flat surfaces for disinfection purpose.

As robots are playing a vital role in the healthcare industry, this disinfecting robot is an efficient way to sterilize any surface.

It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, its energies the electromagnetic field which produces the temporary magnetic field. This magnetic field moves the relay armature for opening or closing the connections. The small power relay has only one contacts, and the high-power relay has two contacts for opening the switch. The inner section of the relay is shown in the figure below. It has an iron core which s wound by a control coil.



#### 5. CONCLUSION

UV light disinfecting robot has been designed and developed aiming to disinfect hospitals and other infected areas. As robots are being widely used for the works that humans are at risk of, using

robots for disinfecting work is the best choice. It has been seen that the robot emits UV light of particular wavelength 220nm-280nm which kills the DNA of the pathogens present on the surface and prevents it from further growth. These robots reduce exposure to risk and also save time. These robots also has other advantages like, they reduce labor expenses, has less maintenance and they also dosent need any extra chemicals to do its job. And it is very safe and reliable as it can work all day and night. The cost of the robot is around 2000-2500. The cost is quite affordable for the work it does.

## 6. REFERENCE

1. [https://www.researchgate.net/publication/344666882\\_UVC\\_disinfection\\_robot](https://www.researchgate.net/publication/344666882_UVC_disinfection_robot)
2. <https://ieeexplore.ieee.org/document/9362728>
3. <https://www.stouchlighting.com/blog/faqs-about-uv-disinfection-lighting-the-basics>
4. [https://www.who.int/uv/health/uv\\_health2/en/](https://www.who.int/uv/health/uv_health2/en/)
5. <https://www.irjet.net/archives/V7/i8/IRJE-T-V7I8508.pdf>
6. <https://create.arduino.cc/projecthub/Rucksi-kaaR/automatic-uv-c-disinfection-robot-c3c230>
7. <https://www.therobotreport.com/third-generation-uv-c-disinfection-robot-available-uvd-robots/>
8. <https://www.frontiersin.org/articles/10.3389/frobt.2020.590306/full>
9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7123593/>
10. <https://www.fda.gov/medical-devices/coronavirus-covid-19-and-medical-devices/uv-lights-and-lamps-ultraviolet-c-radiation-disinfection-and-coronavirus>
11. <https://www.avarobotics.com/disinfectionrobots>
- 12 Vemula, P., Dhar, R.S., 2022, Design of 8T SRAM using 14nm FINFET Technology [Konstrukcja 8T SRAM przy użyciu technologii 14nm FINFET], Przegląd Elektrotechniczny, 10.15199/48.2022.10.07
- 13 Shareef, S.K., Sridevi, R., Raju, V.R., Rao, K.S.S., 2022, An Intelligent Secure Monitoring Phase in Blockchain Framework for Large Transaction, International Journal of Electrical and Electronics Research, 10.37391/IJEER.100322
- 14 Patel, P., Sivaiah, B., Patel, R., 2022, Approaches for finding Optimal Number of Clusters using K-Means and Agglomerative Hierarchical Clustering Techniques, 2022 International Conference

on Intelligent Controller and Computing for Smart Power, ICICCSP 2022, 10.1109/ICICCSP53532.2022.9862439

15 Rao, G.S., Kalyan, C.N.S., Kumar, C.V.V., Goud, B.S., Kumar, M.K., Reddy, C.R., 2022, Automatic Voltage Regulator Using Global Optimization Algorithms Based on Traditional Controller, 2022 International Conference on Intelligent Controller and Computing for Smart Power, ICICCSP 2022, 10.1109/ICICCSP53532.2022.9862470

16.Sai Kalyan, C.H.N., Srinivasa Rao, G., Rambabu, K., Kumar, M.K., Goud, B.S., Reddy, C.R., 2022, Exhibiting the Effect of AVR Coupling on the Performance of LFC in Multi Area Hybrid Power System, 2022 3rd International Conference for Emerging Technology, INCET 2022, 10.1109/INCET54531.2022.9824930