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# UV Sterilization Robot

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## ABSTRACT

*This project describes the evolving role of robotics in healthcare and allied areas with special concerns relating to the management and control of the spread telenovel corona virus disease 2019 (COVID-19). The prime utilization of such robots is to minimize person -to-person contact and to ensure cleaning, sterilization and support in hospitals and similar facilities such as quarantine. This will result in minimizing the life threat to medical staffs and doctors taking an active role in the management of the COVID-19 pandemic. Ultra Violet (UV) light is used for the purpose of sterilization of rooms and surfaces. UV is employed as it has germicidal properties in particular bacteria and viruses, but it is detrimental to human beings as well.*

***Keywords:—*** *UV, Sterilization, ESP-32 CAM, Arduino, Robotics, Healthcare*

## I. INTRODUCTION

Sanitization, which has become a very important aspect in these pandemic times and plays a very crucial role in preventing us from exposure of this deadly virus and thus helping in eradication of this global pandemic is very important. One of the high -risk zones of exposure to this deadly virus is in the area where people rush to for the cure, that are the hospitals and the medical wards. The ultimate aim of disinfection and sterilization is to inactivate or eliminate microorganisms in order to avoid the spread of airborne diseases and infections. Proper disinfection and sterilization aids in reduced probability of disease transmission. For the purpose of disinfection, UV light is one of the best possible solutions. UV-C light has a diverse range of applications in the fields of disinfection and sanitization it is economical and environment-friendly to use UV light due to its high replacement cycle.

The project work puts forth a solution with our wireless robot which is remotely operated via WiFi.

## II. Components

**Table 1: Estimate Cost of the Components**

| Sr. no | Component | Price |
|---|---|---|
| 1 | ESP-CAM Development | 999 RS |
| 2 | L298 Motor Driver Module | 150 RS |
| 3 | 12V DC Geared Motor-100 RPM | 300 RS |
| 4 | 2 Channel Relay Board - 12V | 180 RS |
| 5 | UV LED | 100 RS |
| 6 | Jumpers | 150 RS |
| 7 | 7805 Voltage Regulator | 99 RS |
| 8 | PCB | 299 RS |
| 9 | 70x20 wheels | 399 RS |
| 10 | Robot Chasis | 800 RS |
| 11 | Dummy Shaft | 260 RS |
| 12 | 18650 Battery | 100 RS |
| 13 | Battery Holder | 500 RS |
| 14 | Charger | 470 RS |
| | Total cost | 4799 RS |

## III. Circuit Diagram

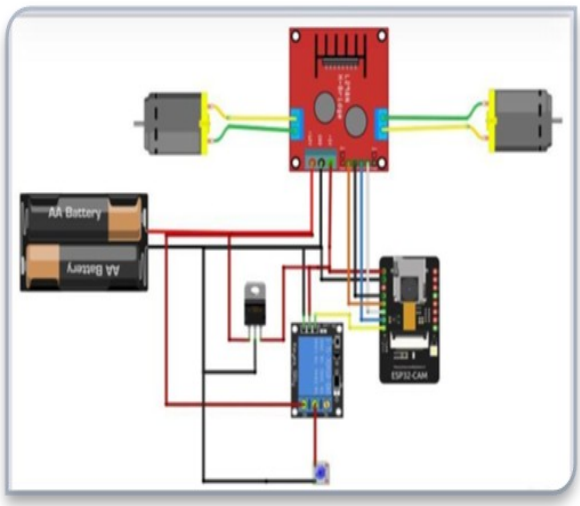


*Figure 1: Circuit Diagram of Proposed System*

## IV. UV Sterilization Robot Working

This UV Sterilization Robot can be easily built using the ESP32-CAM module. Apart from the ESP32-Camera module, here we will use two DC motor with Robot chassis and L298 D motor driver module to build this Robot. ESP32 is one of the most popular boards to build IoT based projects. The **AI-Thinker ESP32-CAM module** comes with an ESP32-S chip, a very small size OV2640 camera and a microSD card slot. MicroSD card slot can be used to store images taken from the camera. Here **HTTP** communication protocol will be used to receive video streaming from the OV2640 camera over the web browser. The web page will also have buttons to move the car in Left, Right, Forward and reverse directions. The **ESP32 -CAM** module can be programmed with **Arduino IDE**. The ESP32-CAM module also has several GPIO pins to connect to external hardware. ESP32-CAM doesn't have a USB connector, so we need an FTDI board to upload the code into ESP32-CAM. VCC and GND pin of ESP32 is connected with the VCC and GND pin of the FTDI board. Tx of and Rx of ESP32 is connected with Rx and Tx of the FTDI board Two DC motors are connected to ESP32 through the L293D module. Module pins are connected to IO4, IO2, IO14, and IO15 pins of ESP32.

## V. Proposed Work

We would like to propose that till today we have done research on various research papers and tried to make our project more innovative and reliable. The UV Robot can be easily built using the ESP32-CAM module. Apart from the ESP32-Camera module, here we have used the Robot chassis on which two 12V DC Geared motors of 100rpm are connected to the 70x20 wheels. The DC Motors will control the directions of the Robot. This circuit

includes the L298, which is a dual H-bridge DC motor driver used for supplying the required current to DC motors, and it controls the speed and the movement direction of the DC motors the 18650 battery holder is mounted on the chassis which has two chargeable 18650 batteries. A general purpose PCB board is mounted on the chassis. We will program the ESP32-CAM using Arduino IDE. For that, we have installed the ESP32 add-on on Arduino IDE. We are working on assembling the components and on programming. Within a span of 2 months, the project assembling will be completed and we will start with the programming part of our project.

## VI. Project Model

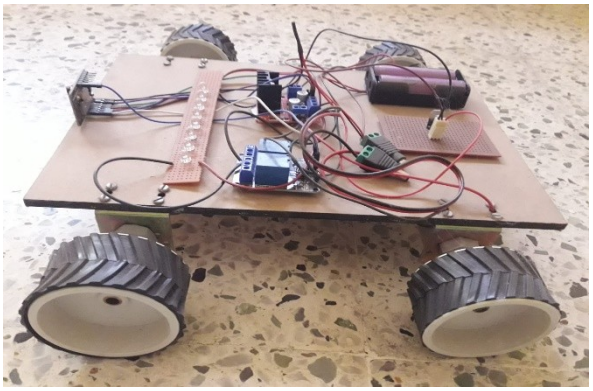

*Figure 2: Working Model of UV STERILIZATION ROBOT(Side View)*

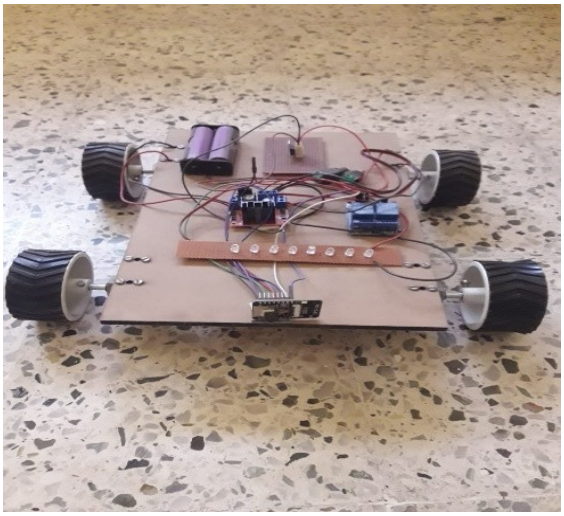

*Figure 3: Front View of Working Model*

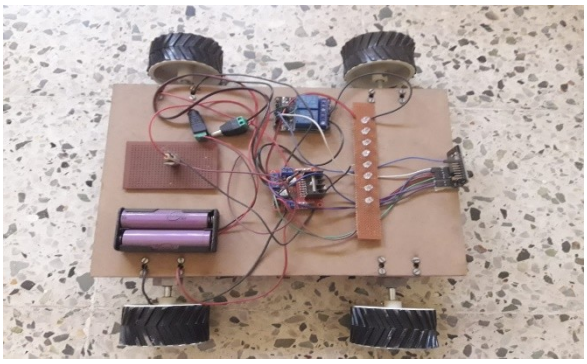

*Figure 3: Top View of Working Model*

## VII. Applications

***Hospitals*:** UVS robots provide hospitals, nursing homes and other critical care environments with the assurance that dangerous pathogens like Clostridium difficile (C. diff), Acinetobacter and M.R.S.A., to name a few, are attacked before the next patient occupies the room.

***Shopping Malls*:** Especially under the impact of the corona virus, it is a very smart decision to choose disinfection robots to do disinfection in shopping malls. UVS robotscan quickly disinfect the surface and the air, and the robot's automatic navigation function also saves a lot of manual labor**.**

***Public Transport Stations*:** In a situation like COVID-19, such robots help to reduce the spread.

***Schools/Colleges*:** Non-touch methods of disinfectant, have the potential to overcome many of the practical limitations of chemical-based approaches, and may be automated for use in a much wider variety of settings where rigorous disinfectant protocols were previously not feasible, such as in schools/universities.

***Quarantine Centers*:** If appropriately utilized then in an outbreak like COVID-19, these robots can assist in reducing the health hazards of using improperly sterilized equipment & surrounding.

## VIII. REVIEW OF LITERATURE

- Aladin Begic proposed the service disinfectant robots which are simple and effective in disinfection in medical institutions
- Noriyuki YAGI, have proposed Sterilization using 365nm UV-LED.
- Thomas Rubaek, et al. have developed a UV-Disinfection robot to reduce the outspread of diseases and Hospital Acquired Infections (HAIs).
- Pacharawan Chanprakon, Tapparat Sae-oung, Treesukon Treebupachatsakul, Pimkhuan Hannanta-anan, Wibool Piyawattanametha have developed an Ultra-violet sterilization robot for disinfection
- Jui - HsuanYang, et al. have implemented the Hyper Light Disinfection Robot

## IX. CONCLUSION

This study presents a comprehensive overview of the robotics potential in medicine and allied areas with special relation to the control of the COVID-19 pandemic. Effective management of COVID-19 can significantly reduce the number of infected patients and casualties as witnessed in the case of the Chinese outbreak. The UV robot often works in peopled surroundings. Therefore, this robot should not only clean efficiently but also harmoniously integrate with humans. Hence, cognitive abilities can be added to this robot by very simple and efficient theoretical approaches. The cleaning efficiency of the robot can be greatly improved by understanding the environment along with the safety enhancement. To make it more environment friendly, the robot can be made to run on a renewable power source such as solar energy.

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