

Automatic Surface Disinfection and Vacuum Cleaning Robot

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Abstract - Automatic Surface Disinfectant, UV Light, and Vacuum Cleaner Robot is a compact robot system that provides UV disinfection, which not only kills all harmful viruses but also provides a vacuum cleaning service in the room, hospitals, and big offices reducing human labor. This robot eliminates human error and provides much more efficient cleaning activities. Manually cleaning the floor can leave bacteria on the floor by the operator. Also, because it requires manual work, cleaning the floor is time-consuming and cumbersome. Even large offices and hospitals have very large floor areas, and those involved in cleaning cannot clean them more efficiently. This is where this robot comes in handy. Also, the robot is small and compact. So we can carry it and put it where we need it. Even in industry, robots are much cheaper than manual labor. Due to its flexibility, time savings, and efficiency, the robot is ideal for disinfecting and cleaning the floor.

Key Words: Ultraviolet Light, Autonomous, Surface Disinfection, Sterilization, Irradiation.

1. INTRODUCTION

Human lives and livelihoods have been drastically altered as a result of the COVID-19 virus, and the only way to prevent the virus from spreading further is to maintain social distance and obey the standards set forth by our individual governments. Sanitation and sterilization, in particular, have become indistinguishable parts of our daily lives.

When it comes to sanitization, there is a problem: we can't directly participate in the sanitization process because we risk contracting a deadly virus from the contaminated environment. However, we can solve this problem by developing a powerful, efficient, and autonomous robot that can sterilize a space quickly and without exposing ourselves.

Robots are used in a variety of situations where people may be exposed. So, we've created an ultraviolet sanitization robot that will be able to eliminate the coronavirus in the hospital and apartment building along

with vacuum cleaning. For this we'll be using an Arduino, UV LEDs, and ultrasonic sensors to accomplish this.

2. PROPOSED SOLUTION

Cleaning is essential to work everywhere. This can be easy or difficult. Humans cannot be assigned anywhere, as some people may be stationed for cleaning or paying in areas where human presence is dangerous. In addition, surface disinfection and vacuum cleaners are closely related. If you do these two tasks separately, using electronic disinfection means not only takes time, but also consumes more power. Due to the large floor space and the need for multiple people to clean, engineering was needed to make up for these problems. As science advances, robots come to light, but they are manipulated by personnel. More technology is needed to get around this staff limitation.

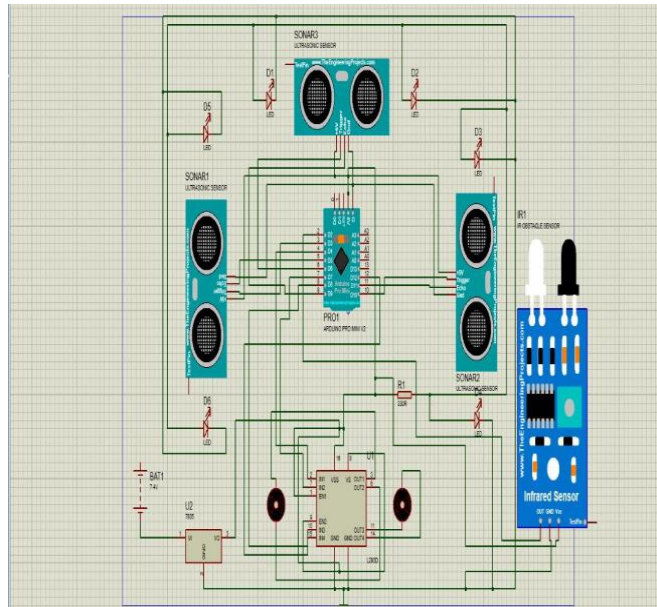
Automation is a great solution to this problem. That's why we have developed an autonomous floor cleaning and surface disinfection robot. The ultrasonic sensor acts as the robot's eye and is therefore the most important component of an autonomous floor cleaning robot. Ultrasonic sensors help detect obstacles and walls and rotate the robot. The detection range of the robot is determined by Arduino Pro Mini programming. In this area, the robot recognizes the obstacle and turns back. Today's homes are smarter and more automated. Home automation brings convenience and creates more time for people.

The main goal of this project is to develop and implement a robot that can simultaneously perform floor disinfection and vacuuming using Arduino Pro mini, motor driver and ultrasonic sensor. UV light automatic surface disinfection robots and vacuum robots have some user-friendly standards.

3. METHODOLOGY

The primary function of the robot is to disinfect rooms and flat surfaces with UV light. Robots have UV LEDs that are responsible for killing viruses. Organisms such as bacteria and viruses are known to be inactivated when exposed to UV light. Ultraviolet light destroys the genetic material of pathogens, the DNA of bacteria and the RNA of viruses,

and prevents them from multiplying. Viral-like COVID 19 can remain active on the surface for extended periods of time, and UV light has been shown to destroy and kill viral RNA, reducing the chance of infection.



The robot has three ultrasonic sensors for detecting left, right and front obstacles. When an obstacle comes in front of the sensor (at a certain distance), the robot turns to the other side and avoids the obstacle. For example, if an obstacle comes in front of the sensor on the left, the robot will move to the right. While the robot is powered on, the UV LED remains on and the sterilization process continues along with the vacuum cleaning. With a total of 10 UV LEDs (2 on each side and 2 on the bottom), bottom sterility of 360 ° or more is possible.

This robot is 100% safe to operate and detects surrounding objects for operation and operator safety (obstacle avoidance). The robot is completely autonomous, and when UV irradiation is performed, the robot will move completely 360 degrees.

4. ADVANTAGES

- Robotic disinfection will work in a standardized method, without the need for ongoing human presence at the disinfection site.
- It requires all primary components. Therefore it is cost-efficient.
- Also, the operation cost is comparatively very low.
- The electricity consumption is less as the robot can perform both tasks (i.e surface disinfectant and vacuum cleaning) simultaneously.

- It saves time as it performs two tasks at one go.
- Ultraviolet rays leave no residue, so it is an environmentally friendly disinfection method.

5. DISADVANTAGES

- It can be used for sanitizing and cleaning floor only.
- The second limitation of using UV light for sterilization and disinfection is that UV only works in its light path and can be blocked by objects. This means that the object to be sterilized is in direct contact with the UV light and there are no obstacles in between. This problem can be solved by using multiple UV lamps that generate UV radiation from different angles.

6. FUTURE SCOPE

This robot can be modified in the future for more effective and versatile work. Cleaning efficiency can be improved. You can add a timer to run it for a specific period of time. This floor cleaning robot is limited to cleaning the attic stairs and cannot be cleaned, so it can be modified to clean the stairs. This robot cannot clean circular spaces. Spaces of any shape can be programmed to be cleaned. Therefore, these are future application areas for floor cleaning robots. Further development of the prototype system will include trial disinfection in a real medical environment (such as a hospital). In the future, it can also be used to disinfect walls and ceilings with UV light.

7. CONCLUSION

- The recent outbreak of COVID 19 has been classified as a global public health emergency. Thus, in addition to traditional precautions, innovative disinfection technologies, including UV light, have also received a great deal of attention.
- Disinfection with vacuum cleaning is a promising tool for hospital surface decontamination, but tomorrow has even greater potential. To overcome the shadowing problem and release the robot's movements in the hospital environment, hospital and equipment design needs to be further coordinated.
- UV technology has been effective in reducing the overall bacterial count and has been significantly more successful than manual disinfection alone on the surface of the hospital. Now it's time to use them for home use.

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