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Novel Approach to Disinfect the Surface Using Disinfecting Robot

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Abstract: ***In olden days people used cow-dung to neutralize virus and germs. In subsequent days people started to clean their house and surroundings using phenol, mercury, sodium hypochlorite etc. People wish to clean the entire surface by hand only, sophisticated tools were not available to clean the surface. At times people might get some kind of allergic reactions due to direct exposure of chemical compounds.***
During the last decade, the process of sanitization is totally changed where people are disinfecting and sanitizing the entire house or parts of the house using technologically advanced devices implementing the UV-Rays. In this paper we have proposed an automated tool which sanitizes the defined area in a house, office, cabin or commercial places using UV Rays. In this proposed technique we are not using any water or liquid components to sanitize the floor, surface of table, electronic equipment but our proposal is to sanitize using UV Rays, Bluetooth approach and automated control.
Keywords: Ultra-Violet (UV), disinfecting, sanitization, automated robot.

I. INTRODUCTION

Disinfection and sterilization have the ultimate goal of inactivating or eliminating germs in order to prevent the transmission of airborne illnesses and infections. Contaminated surfaces enhance the risk of disease transmission by allowing pathogens to spread through contact or through the air. Disease transmission is less likely with proper disinfection and sterilization. In the prevention and transmission of disease, surface disinfection is critical. A safe existence is ensured by effective and frequent cleaning of the environment. Previously liquids with many chemical compounds were used for sanitization. There are many methods for disinfection. UV radiation is one of the most effective disinfection methods available. Surface disinfection in hospitals and other public places is a good example of ultraviolet germicidal irradiation (UVGI). In the domains of disinfection and sanitization, UV-C light has a wide range of uses. Sterilization of surgical tools and medical equipment is one of UV light's most important applications. This can also be done with low-pressure mercury lamps, which are a less expensive technique to generate disinfecting UV radiation. UV light, on the other hand, is cost-effective and environmentally benign due to its long replacement cycle. The UV spectrum is separated into three parts: UV-A, UV-B, and UV-C. Nonetheless, UV-C radiation is utilized in the sterilization process since it has a wavelength of 100-280nm and has enough energy to kill microorganisms. UVC light has a lot of applications in the realm of sanitation, thus it could be a useful tool in the fight against the new Corona virus. This tool has many advantages over traditional approach of sanitization. It reduces direct exposure of humans to harmful germs and viruses. It reduces time wastage as it does not interrupt the work-flow that is, until the tool is in use no human interruption is allowed. It is also proved to be one of the most effective method of disinfection. Though the UV rays are effective in fighting germs and viruses, precautionary measures have to be taken to avoid exposure of humans to UV Rays.

II. LITERATUER SURVEY

In the paper [1] the author discussed a type of Ultraviolet (UV) that could aid hospitals in an ongoing battle to keep microorganisms from lingering in patient rooms and causing new infections.
In the paper [2] the author discussed an IOT Based alarm system for Garbage Monitoring and Clearance. This system has a level sensor to monitor the garbage level in the bin and when the level is reached, it alerts the municipality officials.
In the paper [3] the author discussed about how Health care-acquired infections (HAIs) constitute an increasing threat for patients worldwide. Potential contributors of HAIs include environmental surfaces in health care settings, where ultraviolet-C radiation (UV-C) is commonly used for disinfection. In the paper [4] the author tells that the hospitals have to learn from the past pandemics and take appropriate infection control measures. Public-health authorities handle much of this education, but hospitals must strengthen communication among clinics and their patients. Current data suggest that people could transmit the new disease before they show symptoms. Reinforcing hand hygiene, use of masks, frequent decontamination of crowded places and finding areas where patients with symptoms can be separated from others have to be considered.

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In the paper [5] the author gives details about how AI is helping in treatments. Two independent groups in the past days have reported that they have used artificial intelligence in different ways to find possible treatments for the novel corona virus, named 2019-nCoV. On Feb 4, researchers from the AI drug discovery company Benevolent and Imperial College London reported that they had used AI software to find an already-approved drug that might limit the virus's ability to infect people. On Feb 6, Insilco Medicine announced that its AI algorithms had designed new molecules that could stop the virus from replicating in people's bodies.

In the paper [6] the author describes about how Corona virus put drug chemical industry on alert. Major drug companies have issued statements in recent days assuring the public that their inventories are adequate in the face of supply chain threats stemming from the novel corona virus. Suppliers of active pharmaceutical ingredients (APIs) are also assuring customers that they are prepared for temporary interruption in the supply of key ingredients from firms in China.

In the paper [7] the author here classifies UV radiation (UV) as a "complete carcinogen". UV is the most important modifiable risk factor for skin cancer and many other environmentally-influenced skin disorders. However, UV also benefits human health by mediating natural synthesis of vitamin D and endorphins in the skin, therefore UV has complex and mixed effects on human health. The amount and type of epidermal melanin is the main factor that determines skin complexion and UV sensitivity.

This paper [8] explores the working principle and applications of an Arduino board. This also explores on how it can be used as a tool for study and research works. Main advantages are fast processing and easy interface. Arduino is an open source microcontroller which can be easily programmed, erased and reprogrammed at any instant of time. Arduino platform was designed to provide an inexpensive and easy way for hobbyists, students and professionals to create devices that interact with their environment using sensors.

In the paper [9] the purpose is to evaluate the role of hydroxychloroquine therapy alone and in combination with azithromycin in hospitalized patients positive for COVID-19. In this multi-hospital assessment, when controlling for COVID-19 risk factors, treatment with hydroxychloroquine alone and in combination with azithromycin was associated with reduction in COVID-19 associated mortality. Prospective trials are needed to examine this impact.

The paper [10] describes about the advances in wireless sensor networks and electronics that have led to the emergence of Wireless Sensor networks (WSNs). WSNs have been considered as one of the most important technologies that can change the future. Advances in wireless sensor networking have opened up new opportunities in healthcare systems. Sensor-based technology has invaded medical devices to replace thousands of wires connected to these devices found in hospitals.

III. PROPOSED METHODOLOGY

This tool is designed to be automatic and it will detect obstacles and avoid those before a collision happen. There are many ways to detect an obstacle, but for this project, we have chosen to do it with an ultrasonic sensor module because it has advantages over conventional IR based obstacle avoidance sensor. First is the range, it has a longer range compared to the range of an IR based proximity sensor. Like IR sensor, sunlight doesn't interfere with the sensing capabilities of the sensor.

1) *Arduino UNO:* It's an ATmega328-based microcontroller board. It has 14 input/output pins for digits.
2) *The HC-SR04:* Ultrasonic module is a distance sensor that uses sonar to determine the distance to an item.
3) *L293D Motor Driver:* This driver is mostly used to drive motors.
4) *7.4V Li-Ion Battery:* This battery is rechargeable.

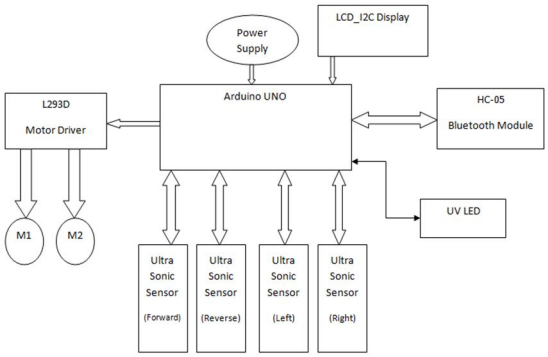


Fig: Block Diagram

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The tool is controlled by Bluetooth using Bluetooth HC-05. The Bluetooth module receives the input command from mobile and passes it to the Arduino UNO as input. The Arduino UNO sends the command to L293d motor driver that controls the motor movement. We used two motors; each motor has two terminals- positive and negative terminal. To rotate motor in forward direction the motors are given with commands m1 (high, low), m2 (high, low). To rotate motor in forward direction the motors are given with commands m1 (low, high), m2 (low, high). To stop, the command given is m1 (high, high), m2 (high, high) or m1 (low, low), m2 (low, low). The command for LCD display is also given by Arduino. Ultrasonic sensors detect obstacles and sends command to Arduino.

IV. RESULTS

Surface disinfection is the aim of the tool that was conceived and constructed. It has been operational for some time. The time is determined by area of the room as well the distance between the robot and the object. This project explores the changing role of robotics in healthcare and related fields, with a focus on the treatment and control of the pandemic situations. The primary purpose of such tool is to reduce human-to-human interaction while ensuring cleanliness, sterilization and support in hospitals as well as other comparable facilities like quarantine. As a result, the risk of death to front-line workers, medical personnel and doctors who are actively involved in the pandemic management will be reduced. The goal is to emphasize the relevance of medical robotics in general, then connect its application to pandemic management so that hospital executives can direct themselves to maximize the usage of medical robots for various medical procedures.

V. CONCLUSION

In this paper we have proposed an automated tool to sanitize the floor area, table surface, electronic equipment, paper and other components in the room using UV-Rays. The proposed tool sanitizes the specific area and disinfects any viruses using UV lights that is mounted on the automated hardware tool. The tool is tested for both automatic mode and manual mode. In case of automation failure, the tool can be controlled externally. The tool is connected to Bluetooth through which the command is given.

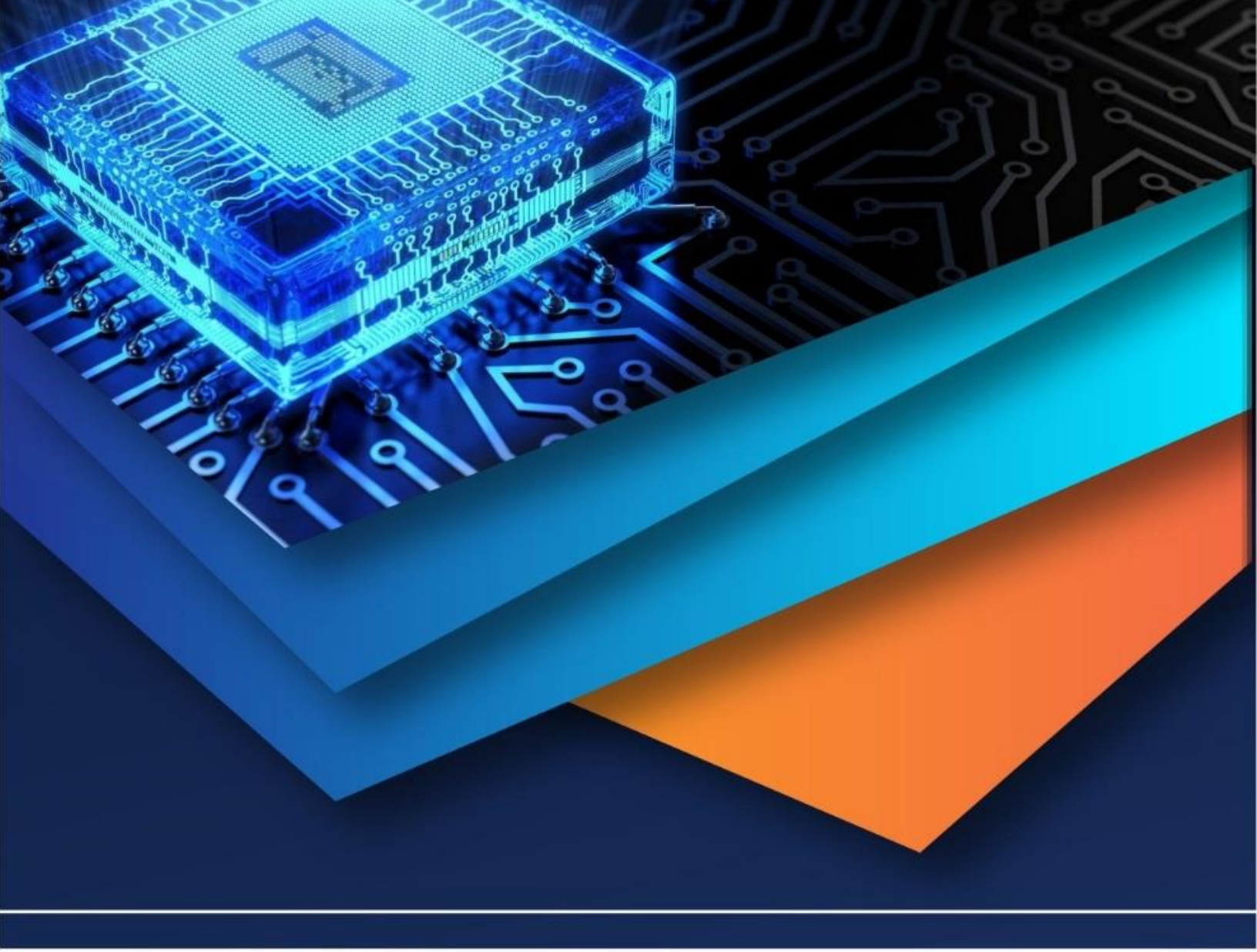
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