

Arduino Based Covid'19 Disinfection Box

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ABSTRACT

Viral outbreaks are extremely infectious and can be lethal. Covid 19 outbreak is currently harming everyone. Disinfecting contaminated surfaces is an important step in preventing the spread of infectious diseases and putting a stop to pandemics around the world. Maintaining safe and sanitary public spaces can be difficult, especially when multiple people touch the same surfaces on a regular basis if not properly maintained. Hand-held disinfection equipment are used to clean public places and frequently touched surfaces. But, manual disinfection in addition to being time-consuming increases infection risks by exposing cleaners to contaminated surfaces. Disinfection techniques are just one of several advancements made possible by the current COVID-19 outbreak on the public, social, and medical levels. The paper presented here describes an automated way of sanitizing the different surfaces without actually caressing the surfaces.

Keywords – Covid 19, Sanitization, Arduino Uno, UV Tubes, Ultrasonic Sensors

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I. Introduction

The coronavirus outbreak is currently affecting the entire world. These kind of vigorous outbreaks are extremely contagious and potentially fatal. Disinfecting contaminated surfaces is one of the crucial steps in preventing the spread of infectious illnesses and slowing down the progress rate of pandemics worldwide. Public areas and frequently handled surfaces are physically cleaned using hand-held disinfection appliances. Manual disinfection being time-consuming also increases infection risks by exposing cleaners to contaminated surfaces. Several disinfection techniques are just one of several advancements made possible by the current COVID-19 outbreak on the public, social and medical levels. Bacteria and viruses can spread to sites that are difficult to sanitize because of the path they follow. Surface-level environmental disinfection is an important strategy for preventing sickness spread in medical facilities. However, bacteria from polluted surfaces may remain intact. To address to this severe issue and prevent the spread of viruses and germs, an affordable UV robot is being developed. Here, we are proposing a system of potential application which includes robotic surface decontamination. A low-cost UV robot is being created to help limit the transmission of such kind of viruses and germs. This may increase the sanitization quality of the different surfaces and hence will be useful for the society. The application

of this proposed system would be in Hospitals, Malls, Workplaces, Public places, Housing Society, etc. To assist clean personal goods after returning from the outdoors and get rid of any remaining bacteria on personal stuff, modern technology like UV ovens have been developed. While prolonged exposure to the same radiation can be detrimental to both people and animals. We have a covering to keep both people and animals safe in order to prevent such situations.

II. Literature Survey

Aladin Begic in his paper named "Application of Service Robots for Disinfection in Medical Institutions" [1] discussed about various service robots which are used in medicine industry mainly for disinfecting surrounding. This paper proposes the medical service robots, focusing on the robots in service that are utilized for cleaning in hospitals and other medical facilities. It shows and describes how much disinfection service robots contribute to the very fast, effective and simple disinfection of medical institutions. The paper also states how to use the above-mentioned technology which can reduce the risk of infection and cost of cleaning in medical fields.

Marcel Bentancor and Sabina Vidal in their paper named "Programmable and low-cost ultraviolet room disinfection device" [2] discuss about a device for disinfecting a room that uses ultraviolet-C light to eradicate high levels of germs

on room surfaces and describes how the device may be remotely configured using an Android-based mobile smartphone. The utilization of the mentioned experimental tests demonstrated the very sanitizing method utilized by this device. This method is effective against a wide variety of microorganisms, and it possesses a number of benefits in comparison to sanitizing processes that are based on the use of chemicals. This apparatus is an open-source, secure, two-speed, and automated piece of equipment for the cleaning and disinfection of rooms. They also outline that switching to an automated method instead of a manual helps in continuous monitoring. Their study helps in understanding the advantage of technology as well as its interfacing with the Arduino microcontroller.

A.Vyshnavi, A. Naga Sri Manasa, Ch. Sessa Sai Hamsika1 and P. Shalini [3] created a UV Robot with infrared sensors at the bottom of the base that can follow a predetermined course in their article titled "UV Disinfection Robot with Automatic Switching on Human Detection." They put it into practice by connecting an Arduino microcontroller to three 20W UV lights and PIR sensors to detect the presence of people or animals. The ultraviolet sterilizing robot is unassuming and also has an automatic on/off switch for situations when it recognizes a person or animal to prevent damage.

In their study titled, "Robot Prototype for Disinfection of Surfaces" Disha Deepu, Aishwarya Mohan, Alisha Dangat, Rasika Dhamane, Sadhana Pai, [4] devised a disinfection system and installed it on a robotic platform that uses UV light to clean the surfaces. This proposed system sanitizes the surfaces with the help of UV rays and they have also further deployed the system using Raspberry Pi.

III. Methodology

The device's primary function is to rid surfaces of any dangerous bacteria or pathogens. It is vital to remove these organisms because of the high rate of transmission they have through the medium of air on any surfaces. UV radiation effectively addresses this problem. It destroys germs by deactivating their vital components. Radiation is employed to do this, which damages the DNA and RNA of the bacteria. This prevents the germs from reproducing and growing, effectively killing them. UV radiation has been routinely used to clean operational equipment, particularly in the medical business. Arduino is an open source prototyping platform. The software will run in the Arduino IDE. It is feasible to create code on a computer and then upload it onto a physical board. The Arduino board is a board that may be utilized by sending a set of instructions to the microcontroller that is embedded

in it via the usage of the Arduino integrated development environment (IDE). In order to write the code for the Arduino, we will use Embedded C. In Embedded C, we will construct a disinfection box and control the working of it.

IV. Block Diagram

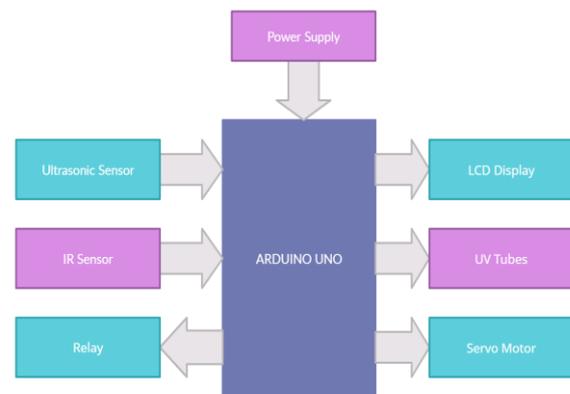


Fig.1 Block Diagram

Fig. 1 illustrates the block diagram. So the main fundamental concept behind this proposal is to built UV disinfecting chambers that have already been introduced to the market with all 360-degree full-surface disinfection. This project solves those limits by disinfecting all surfaces by mechanically turning the items after disinfecting one. Servo meter is used for the same.

4.1 Arduino Uno

A microcontroller board, the Arduino Uno is based on the ATmega328 microprocessor. It has a USB connection, a power jack, an ICSP header, a reset button, and 14 digital I/O pins, of which six are PWM outputs. It also has 6 analogue inputs, a quartz oscillator running at 16 MHz, and a reset button. Fig.2 shows the Arduino Board.



Fig.2 Arduino Board

4.2 UV Tube

UV kills germs by rupturing cell membranes and changing DNA/RNA.

4.3 LCD Display

There are two 16x2 LCDs that can show 16 characters every line. This module is preferred over 7 segment LED modules and other multi segment LED modules. On this LCD, each letter is represented by a 5x7 pixel matrix. This LCD is equipped with two registers: Command and Data.

4.4 Ultrasonic Sensor

By generating an ultrasonic sound wave and translating the reflected sound into an electrical signal, an ultrasonic sensor measures the distance between two objects.

4.5 IR Sensor

An infrared sensor is able to both measure and detect the presence of infrared radiation in its immediate environment.

4.6 Servo Meter

A servomotor is a rotary or linear actuator that allows for precise control of the position, velocity, and acceleration of angular or linear motion. Servomotors may be either linear or rotary. An appropriate motor is connected to a position feedback sensor in order to make up this component. Circuits may be opened and closed using relays, which are switches that can be electromechanical or electronic.

4.7 Relay

Electrical circuits may be regulated with the use of devices called relays, which do this by opening and closing connections in another circuit. Electromechanically or electrically, switches may open or close a circuit depending on the situation. This role is performed by relays. The opening and closing of contacts in one electrical circuit are controlled by relays in a separate circuit, which in turn controls the opening and closing of contacts.

V. Flowchart

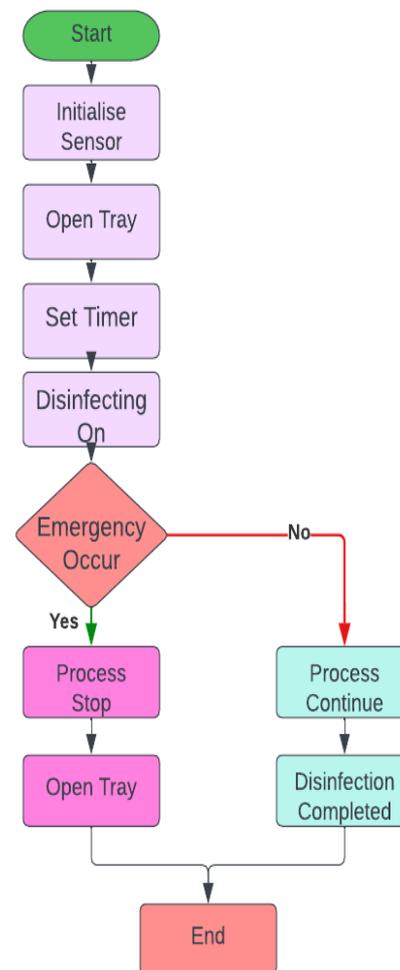


Fig.3 Flowchart

VI. Simulation

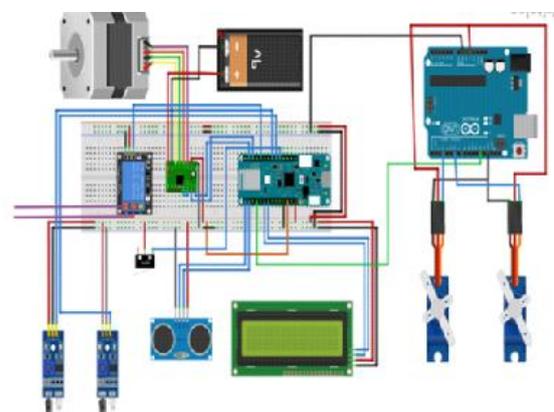


Fig.4 Simulation

Fig.4 shows the circuit build in simulation software.

VII. Results

The tray is opened using sensor. When hand is put in front of the sensor, it senses the movement and the tray opens. We can place the object to be disinfected in that tray. The placed object gets disinfected from one side and then using the servometer, the object gets turned upside down. Now, disinfection happens from other side too. Timer is set accordingly. When the disinfection is done using UV light, the tray opens and we can collect the placed object which is completely disinfected now. Fig.5 illustrates the actual proposed project.

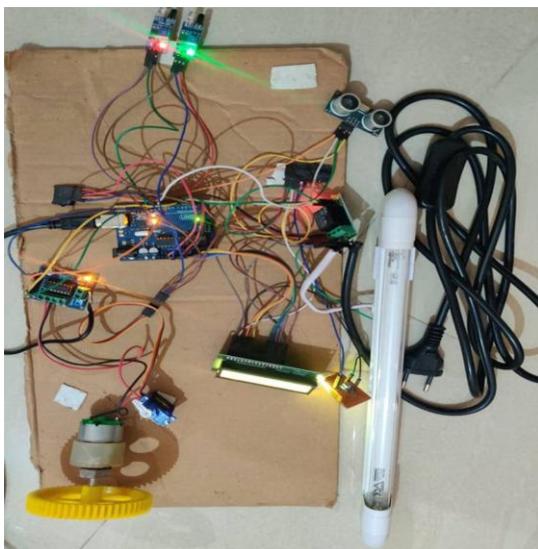


Fig.5 Actual Proposed System

VIII. Conclusion

The goal of our idea was to create an alternative for handheld manual devices for disinfecting public and private environments. We sought to replace the current practice of employing chemical disinfectants and manual cleaning with an autonomous robot that requires very little human intervention using Arduino Uno.

The advantages of proposed system includes that it is touch free and disinfection happens for complete 360-degree. It also kills complete bacteria with the help of UV light. The applications of this proposed system are that it can be used in private workplaces, in public workplaces, at homes, in government offices, at Malls, in hospitals etc.

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