

SMART ULTRAVIOLET DISINFECTION BOX

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Abstract: Covid19 changed all humankind in 2020. Due to its fast and efficiently spreading nature, everyone forced to use face masks and gloves to cover everything from that touch. Covid- 19 outbreak was pivotal for everyone. Proper cleaning & disinfecting are important for reducing spread of Covid- 19. So disinfecting polluted shells is an important step in precluding the spread of contagious conditions and putting a stop to afflictions around the world. Maintaining safe and aseptic public spaces can be delicate, especially when multiple people touch the same shells on a regular basis if not duly maintained. Hand-held disinfection outfit is used to clean public places and constantly touched shells. Currently, colorful environmental public settings worldwide, from hospitals and health care installations to shopping promenades and airfields are considering perpetration of UV disinfection bias for disinfection of constantly touched shells and circulating air aqueducts. Also, the general public utilizes UV sterilization bias for colorful shells, from doorknobs and keypads to particular defensive outfit, or air sanctification bias with an integrated UV disinfection technology.

Keywords: Covid-19, UV disinfection, Sanitization, Arduino Uno

1. INTRODUCTION

Ultra Violet (UV) radiation is a highly effective method for sterilization and disinfection, both da in domestic and clinical settings. It offers several advantages over other methods and can be used to sterilize a wide range of items such as food packets, books, stationery, medical equipment, toys, and electronic gadgets like mobile phones, laptops, and wristwatches. UV light is especially efficient in situations where other sterilization methods may not be suitable. UV radiation, particularly the UV-C wavelength range of 100-280 nm, is considered the best disinfectant for purifying water, air, and sterilizing various items, including surgical equipment. It possesses a shorter wavelength, higher frequency, and energy compared to other forms of electromagnetic waves. UV-C radiation has been extensively studied and found to be highly effective in killing harmful fungi, protozoa, bacteria, and viruses, including the SARS-CoV-2 virus responsible for the COVID-19 pandemic.

One of the key advantages of UV light as a sterilizing agent is its eco-friendliness when used in a controlled manner. Unlike some other sterilization methods, UV radiation does not release any waste or chemical by products that can be harmful to the environment. This makes it a preferred choice for various applications, especially in situations where sustainability and environmental impact are important considerations. UV sterilization works by damaging the genetic material (DNA or RNA) of microorganisms, preventing their replication and rendering them inactive, it is a non-chemical process that does not require the use of additional substances, making it safe for a wide range of materials and surfaces. Moreover, UV sterilization is a relatively quick process, reducing the time required for disinfection compared to other methods such as heat or chemical treatments. However, it is important to note that UV radiation should be used with caution, as direct exposure to UV-C light can be harmful to human skin and eyes. Proper protective measures, such as using UV-resistant materials or shielding, should be employed to ensure safety during the sterilization process.

2. Smart Ultraviolet Disinfection Box

In today's rapidly evolving world, maintaining a clean and safe environment has become more important than ever. With the constant threat of harmful bacteria, viruses, and other pathogens, we must embrace innovative solutions that prioritize health and well-being. That's why we are proud to introduce the Smart Ultraviolet Disinfection Box, a groundbreaking project that combines cutting-edge technology with exceptional

efficiency to ensure the utmost cleanliness and safety for individuals and communities alike.

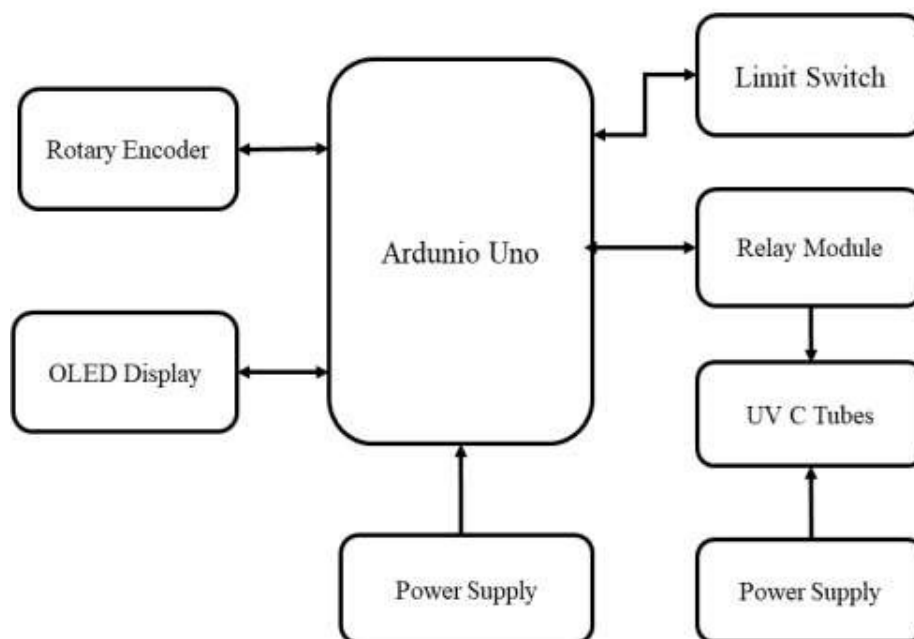


Fig. 1 Block Diagram Smart Ultraviolet Disinfection Box

3. Implementation of the System

Fig. 2 shows the circuit diagram of the Smart Ultraviolet Disinfection Box in this system using Arduino Uno as the main controller, which is basically the heart of this system. We use a rotary encoder to set the timing and modes of the disinfection process. The OLED display shows the overall data of the box, and on that display are timings, modes, and instructions. The relay module we used as a switch to turn on and off UVC Tubes when disinfection operations started. The limit switch is used to protect the skin from UVC light when the disinfection process is going on. There are two power supplies used for UVC tubes. We used a 230V AC power supply, and to power other electronic components, we used a 5V DC power supply. There will be two modes of operation. First will be Manual Mode, wherein you have to manually turn off the lamp. The second one will be a Timer Mode, where in the lamp will be turned on for a set amount of time. A menu will be created and displayed on an OLED display. The menu can be controlled using a rotary controller.

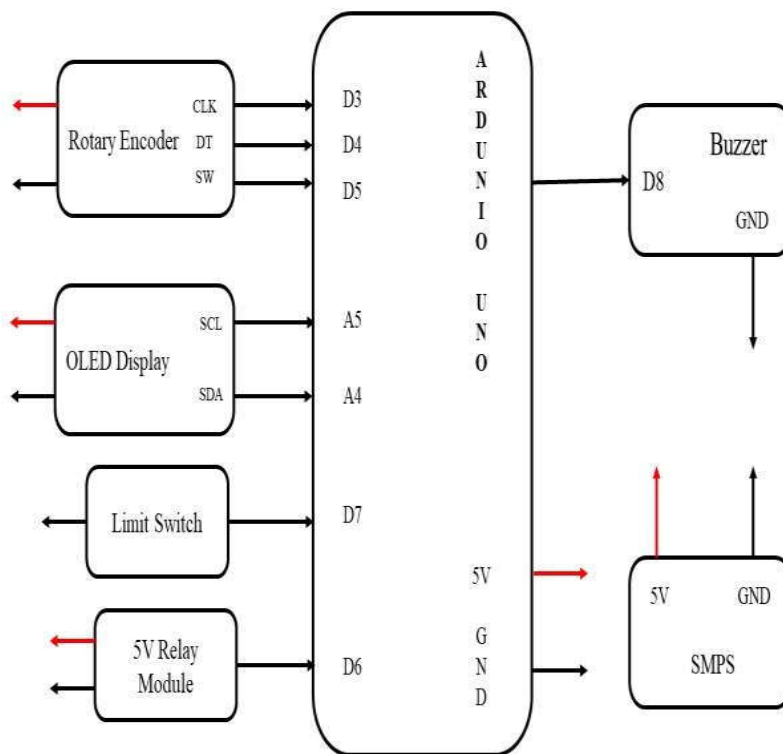


Fig. 2 Smart Ultraviolet Disinfection Box

4. RESULTS AND DISCUSSION

In Smart Ultraviolet Disinfection Box if inserted different items for disinfection process. SUDB has two modes – Automatic Modes and Manual Modes in Main Menu.

4.1 Automatic mode:

Table 1. Result of Automatic Mode

Sr. No.	Items	Door Buzzer Status	Duration	Disinfection Status
1	Clothes	Off	1 min	successful
		On	-	unsuccessful
2	Accessories	Off	3 min	successful
		ON	-	unsuccessful
3	Electronic Gadgets	Off	5 min	successful
		On	-	unsuccessful
4	Documents	Off	5 min	successful
		On	-	unsuccessful

For this mode different items are selected. If door does not closed properly then buzzer will get activated. Until the door does not closed properly the buzzer gives indication for it. UV rays are harmful to our body so the door must be locked properly. There are three timers for 1minute, 3minutes and 5 minutes for this process. Users have to ON the box supply and then should select Automatic Mode

•First clothes are inserted into the box. If door is closed properly the buzzer will not get activated so the process for disinfection gets successful. For this process 1 minute timer is selected. If door does not closed properly the buzzer will get activated so the process for disinfection gets unsuccessful.

•Secondly Accessories are inserted into the box. If door is closed properly the buzzer will not get activated so the process for disinfection gets successful. For this process 3 minute timer is selected. If door does not closed properly the buzzer will get activated so the process for disinfection gets unsuccessful.

•Next Electronic Gadgets are inserted into the box. If door is closed properly the buzzer will not get activated so the process for disinfection gets successful. For this process 5minute timer is selected. If door does not closed properly the buzzer will get activated so the process for disinfection gets unsuccessful.

•Lastly Documents are inserted into the box. If door is closed properly the buzzer will not get activated so the process for disinfection gets successful. For this process 5minute timer is selected If door does not closed properly the buzzer will get activated so the process for disinfection gets unsuccessful.

Please initially capitalize only the first word in other titles, including section titles and first, second, and third-order headings (for example, “Titles and headings” — as in these guidelines). Leave two blank lines after the title.

4.2 Manual mode:

Table 2. Result of Manual Mode

Sr. No.	Items	Door Buzzer Status	Duration	Disinfection Status
1	Clothes	Off	2 min	successful
		On	-	unsuccessful
2	Accessories	Off	4 min	successful
		ON	-	unsuccessful
3	Electronic Gadgets	Off	10 min	successful
		On	-	unsuccessful
4	Documents	Off	7 min	successful
		On	-	unsuccessful

For this mode different items are selected. If the door does not closed properly then buzzer will get activated. Until the door does not closed properly the buzzer gives indication for it. UV rays are harmful to our body so the door must be locked properly. There are no timers for this mode. So the time period is depends on user requirement. Users have to ON the box supply and then should select Manual Mode.

•First clothes are inserted into the box. If door is closed properly the buzzer will not get activated so the process for disinfection gets successful. For this process after 2 minute duration user have to stop the process. If door does not closed properly the buzzer will get activated so the process for disinfection gets unsuccessful.

•Secondly Accessories are inserted into the box. If door is closed properly the buzzer will not get activated so the process for disinfection gets successful. For this process 4 minute duration user have to stop the process. If door does not closed properly the buzzer will get activated so the process for disinfection gets unsuccessful.

•Next Electronic Gadgets are inserted into the box. If door is closed properly the buzzer will not get activated so the process for disinfection gets successful. For this process 10

minute duration user have to stop the process. If door does not closed properly the buzzer will get activated so the process for disinfection gets unsuccessful..

•Lastly Documents are inserted into the box. If door is closed properly the buzzer will not get activated so the process for disinfection gets successful. For this process 7 minutes duration user have to stop the process. If door does not closed properly the buzzer will get activated so the process for disinfection gets unsuccessful.

6. Conclusion

Smart Ultraviolet Disinfection Box project is designed to provide an effective and user-friendly solution for disinfecting various items using UVC lamps. The project incorporates several important features to ensure safety and efficiency. The use of UVC lamps attached at the bottom and top of the box ensures that the entire surface of the items placed inside is exposed to the disinfecting UV light. To enhance the effectiveness of the disinfection process, the inside of the enclosure where the light will hit is covered with aluminum tape. This helps in reflecting the light evenly, ensuring thorough disinfection. Safety is prioritized in the project through the inclusion of a limit switch. The switch ensures that the lamps can only turn on or remain on when the door is closed, preventing any accidental exposure to UVC light. This feature provides an extra layer of protection for users.

The control system of the Smart Ultraviolet Disinfection Box is based on an Arduino Nano offers two modes of operation for convenience. The first mode is Manual Mode, where the user manually turns off the lamp. The second mode is Timer Mode, where the lamp automatically turns off after a set amount of time. A user-friendly menu is created and displayed on an OLED display, allowing easy navigation and selection of the desired mode. The menu can be controlled using a rotary controller, providing a straightforward interface for users. Overall, the Smart Ultraviolet Disinfection Box project combines efficient disinfection capabilities with safety features and user-friendly controls. It offers a practical solution for disinfecting various items and can be a valuable addition to environments where cleanliness and hygiene are of utmost importance.

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