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IoT Based UVC Rays Classroom Sanitization Device

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ABSTRACT: Here is presented a room disinfection device based in Ultraviolet-C radiation. Initially, it was designed for the periodic conditioning of culture rooms. It offers the capacity to be remotely programmed using an Android mobile device and it has an infrared detection security system that turns off the system when triggered. The system here described is easily scalable to generate higher ultraviolet dosages adding more UV-C lamps. The experimental tests showed the very high effectiveness of this device to eliminate high bacterial inocula. The sanitizing method employed by this device affects a very wide range of microorganisms and it has several advantages respect to chemical based-sanitizing methods. The total cost to make this open source device is below USD 180 and it is easily customizable which is different respect to proprietary commercial devices actually available. This device represents an open source, secure, fast and automatized equipment for room disinfecting. The robot can estimate automatically the disinfection time while monitored by Wi-Fi connection from a phone or a tablet.

KEYWORDS:IoT, Sanitization devices, MIT app Inventor, Nodemcu, UVC Rays.

I. INTRODUCTION

Ultra violet (UV) light is used for the purpose of disinfection or 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 .so for the purpose of disinfection without human interference, a UV light has been designed and implemented that follows a predefined path. Given that UV light can be dangerous to humans, that's why we are using node MCU which is based on Iot that's connect our smart phone and and device wireless. So, one of the effective ways to avoid getting infected with viruses by sterilizing rooms using UV light.

Surface disinfection plays a vital role in disease prevention and transmission. Effective and frequent disinfection of surroundings ensures a safe life. For the purpose of disinfection, UV light is one of the best possible solutions. The disinfection of surfaces in hospitals or colleges is a very prominent example of ultraviolet germicidal irradiation (UVGI) UV-C light has a diverse range of applications in the fields of disinfection and sanitization. So our device is the way to sanitize classrooms and other places by our smart phones. And this is safe method to sanitize area.

- A. UV disinfection UV-C radiation is considered as the best germicidal wavelength range (200-250 nm) which inactivate Micro organisms. DNA or RNA viruses cannot withstand at the radiation of UV-C which kills them. This disinfection is works when the object or surface exposed to UV light.
- B. A Device made by some mechanical shaft assembly. Which is used for the moment of the UVC bulb.

II. WORKING

Objective of proposed methodology:

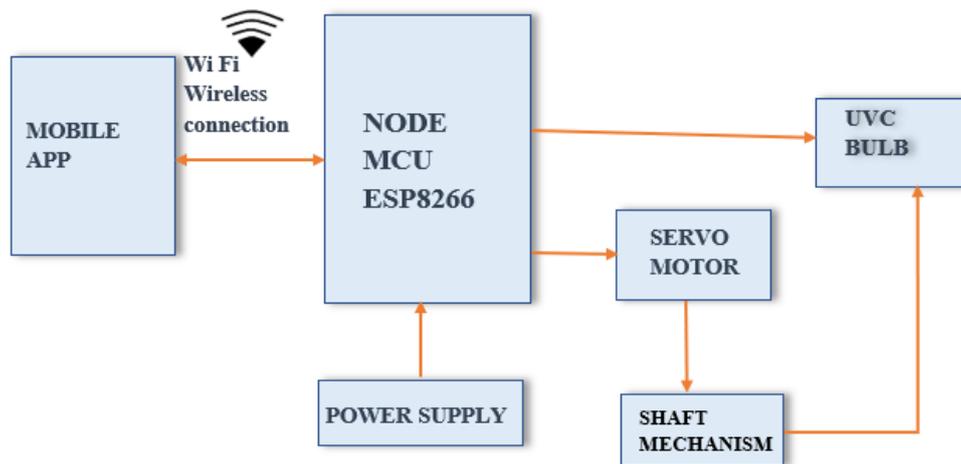
Instead of traditional method we can use UVC light. Which has capacity to kill bacteria and it can reach at all corners of class. Our device is easy to use and safe for fast sanitize surfaces.



Proposed Work:

The aim of our project is to provide a high security system against germs and bacteria using uv ray and Iot. This device controlled by mobile app for make device touch free, The proposed work is as follows:

- 1) Interfacing mobile app to the node MCU
- 2) Node MCU borrow a command for from the respective mobile app.
- 3) Interfacing servo motor with node mcu
- 4) Command passes to servo motor.
- 5) With the rotation of servo motor UVC bulb rotates.
- 6) By the off command from app the rotation of servo moter stops.



Nodemcu is used as a IoT device in this system. Through mobile app gpio pins of nodemcu get triggered. The communication between Nodemcu and app is done by using wifi. Nodemcu get powered by 5v adpoter. Servo motor is connected with the gpio pins of nodemcu, which get operated through mobile commands. UVC bulb is attach to the another pin of nodemcu through relay. This UVC bulb is attach to the shaft which is connected with servo motor. The Bulb get rotate with servo motor servo motor, that's why the all part of class is covered by the UVC rays. And the class get sanitized.



III.SYSTEM SPECIFICATIONS

In above figure show that basic block diagram of the Iot based UV rays classroom sanitization device, mainly five components are used. By which this device works.

UV_San App

We are creating this Android app for controlling operation of servo motor. This app is developed by MIT app inventor. MIT App Inventor is an intuitive, visual programming environment that allows everyone to build fully functional apps for smartphones and tablets. This app consist many tools. In this app we have added a text box for entering the IP address of nodemcu. UVC control part controls the the function of UVC bulb.



NODEMCU ESP8266

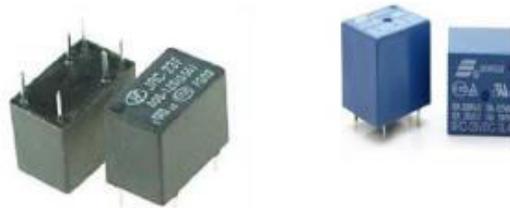
NODEMCU (esp8266) has been selected as the controller for this system due to its compact size, compatibility, easy interfacing over several other type of controller including Programmable Integrated Circuit (PIC), Programmable Logic Controller (PLC) and others.. The board has a built-in USB port that is already wired up with the chip, a hardware reset button, Wi-Fi antenna, LED lights, and standard-sized GPIO (General Purpose Input Output) pins that can plug into a bread board.





Relay

Relay is nothing but it is the electromagnetic switch. Relay allows one circuit to switch another circuit while they are separated. Relay is used when we want to use a low voltage circuit to turn ON and OFF the device which required high voltage for its operation. For example, 5V supply connected to the relay is sufficient to drive the bulb operated on 230V AC mains. Relay is divided into two parts, one is input and other is output. Input side is nothing but a coil which generate magnetic field when small input voltage is given to it. Relay having three contactors: Normally closed (NC), Normally opened (NO) and common (COM). By using the proper combinations of the contactors electrical appliances may turn ON or OFF.



Servo Motor

Servos have three wires coming out of them. Out of which two will be used for Supply (positive and negative) and one will be used for the signal that is to be sent from the MCU. Servo motor is controlled by PWM (Pulse with Modulation) which is provided by the control wires. There is a minimum pulse, a maximum pulse and a repetition rate. Servo motor can turn 90 degree from either direction from its neutral position. servo motor is used here to rotate UVC light bulb. Because of that light will cover all area of class.



UVC BULB

UVC lights are UV germicidal bulbs that emit very short ultraviolet wavelengths from 100 to 280 nanometers that damages the DNA of bacteria, viruses, and other pathogens. These lamps can help eradicate harmful bacteria and are used for a variety of things, namely in the purification of food, water and air. The application of UVC energy to inactivate microorganisms is also known as Germicidal Irradiation or UVGI. UVC exposure inactivates microbial organisms such as bacteria and viruses by altering the structure and the molecular bonds of their DNA.





IV.RESULT AND DISCUSSION

Fig shows the working prototype model of classroom Sanitization Devices.

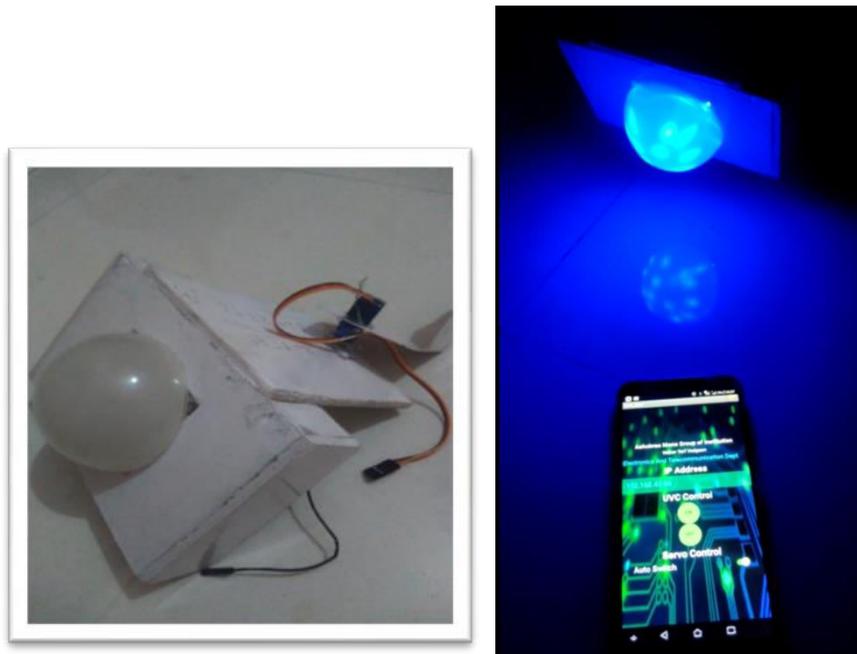


Fig. Prototype Model

V. CONCLUSION

UV Sanitization Device technology was effective at reducing overall bacterial counts and significantly more successful than manual disinfection alone on classroom surfaces. Further evaluation focusing on clinically meaningful reduction in HAIs is of paramount importance in justifying the cost and effort in implementing this promising technology in the battle against pernicious infections. Our results underline important critical issues in standard terminal cleaning (combined manual cleaning and chemical disinfection) on high touch surfaces, to adequately remove microbial contamination from the environment.

VI.FUTURE SCOPE

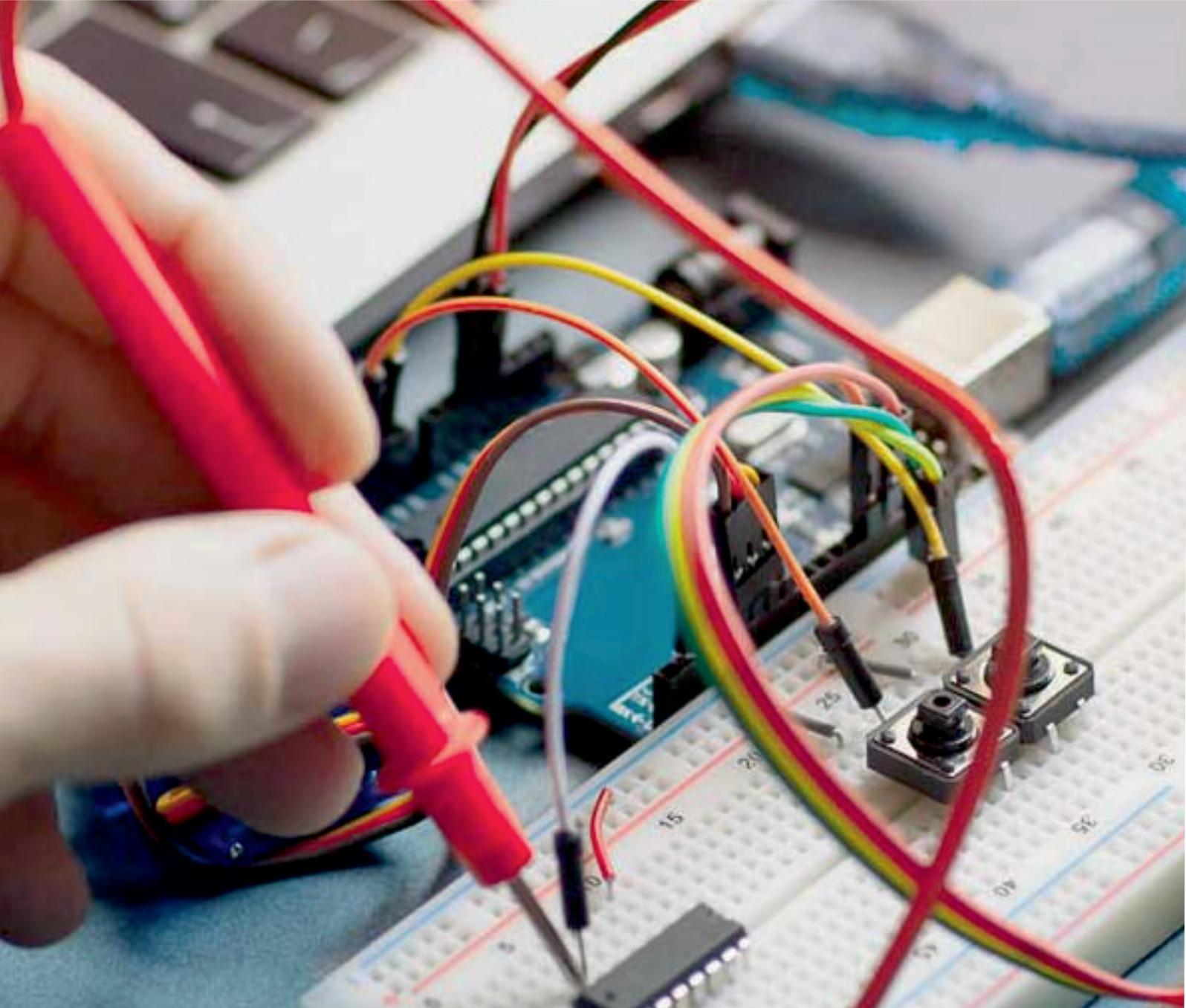
This technology is not only in use now, but it is rapidly developing and maturing. It is a sterilization method that begs to be watched and studied as it has the potential to become a significant game changer in the sterilization domain. For those whose practice branding emphasizes being technologically advanced, this is certainly in keeping with that philosophy.

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