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Design and Development of Covid Disinfection Box

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ABSTRACT: Human history is monitor a very eccentric time fighting an unseen enemy; the novel COVID-19 corona virus. Initially observed in the Wuhan province of China, now fastly spreading around the world. There has been strenuous conflict on how different countries feel for to the covid 19 Pandemic to secure public safety. Covid19 changed all of humankind in 2020. Due to its fast and efficiently spreading nature, we were forced to use face masks and gloves to protect from everything we touch. Well we can use masks to protect us outside but what about the things we bring home from market or things we exchange with other people. For example: We cannot apply sanitizers on fruits, vegetables, packed food, batteries etc we buy from outside or we can't sanitize files, paperwork that doctors exchange with patients or employees exchange with each other. Well we solve this huge problem with a smart electronics system powered by an arduino. We design a 360 degree disinfection box using ultraviolet sterilization to solve the issue. The system makes use of 8 UVC tubes to achieve this task. Now UVC has been proven to kill all viruses within a matter of seconds.

KEYWORDS: PIR sensor, Arduino, optimize, UVC, PIC Microcontroller, Embedded C

I.INTRODUCTION

Severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) caused a global pandemic resulting in disruption of normal life all over the world through a very infectious disease called corona virus disease 2019 (COVID-19). The virus is being speared from aerosols and contacting surfaces. It is essential to use personal protective equipment (PPE) for checking the spread of the disease. In developing countries like India, the sanitization of PPE kits and other personal accessories is in high demand as the throwaway kits/accessories require a huge amount of money. Further, the disposal of PPE kits and other routine items to the environment poses a serious threat. Recent studies have confirmed the presence of SARS-CoV-2 in wastewater which are prone to be transmitted in the and further back to the ecosystem. Hence it is essential to sterilize the contacting surfaces before their disposal to the environment. The design of a cost-effective sanitization device for day-to-day life accessories appears to be one of the promising approaches.

The major stability of SARS-CoV-2 is due to the presence of the surface spike-glycoprotein, which is a three-domain protein with an electric point (pI) of ~5.9. The virus can be inactivated by altering the stability of this protein. Various physical (*e.g.*, temperature and adsorption) and chemical (*e.g.*, pH, disinfectants and surface modification) methods have been explored to test the stability of the spike protein. It has been reported that SARS-CoV-2 remains stable on different surfaces but can be inactivated by heating at a temperature greater than 65 °C for more than 5 min of duration. Sterilizers have been a topic of importance among researchers for the disinfection .Further, the COVID-19 pandemic has emphasized the need to design and develop a sterilization chamber equipped with an appropriate technique studied the influence of five different types of sterilization techniques on the filtration



efficiency of face masks. The five studied techniques were as follows: (1) heat with humidity, (2) steam, (3) 75% alcohol, (4) household diluted chlorine-based solution and (5) ultraviolet germicidal irradiation studied three techniques of decontaminating facemasks: (1) ultraviolet germicidal irradiation, (2) vaporized hydrogen peroxide and (3) dry heat described the technologies of the International Advanced Research Center for Powder Metallurgy and New Materials (ARCI), India, in developing various disinfection systems to combat COVID-19. ARCI used physical, chemical and dry heat processes to disinfect surfaces effectively.

II. PROPOSED SYSTEM

In this proposed system, no-touch technologies can provide mitigation practices by inactivating the virus. Their use during the COVID-19 pandemic could be one of the key points to reduce the risk of transmission both in healthcare and other public spaces. It is recognized that UVC light can stop microbial growth, and its physical approach is considered a good compromise between cost and effectiveness, which is why it is progressively becoming more and more widespread in healthcare and at home finally, a UV chip is cold, has a very low current, and is less influenced by temperature compared to an LED. As described in Part I of this study, it has as partially wider (nonpoint-shaped) radiation source that provides a wider diffusion and energy homogeneity of light in the space. The wavelengths of the chip are centered on the maximum biocidal efficacy values of the UV Cradiation. The Arduino controller takes user input for time setting and starts sterilization when start button is pressed. It automatically shuts off when the sterilization time is completed. Also an automatic shutoff system shuts off the sterilization fluid is opened by user between ongoing sterilization

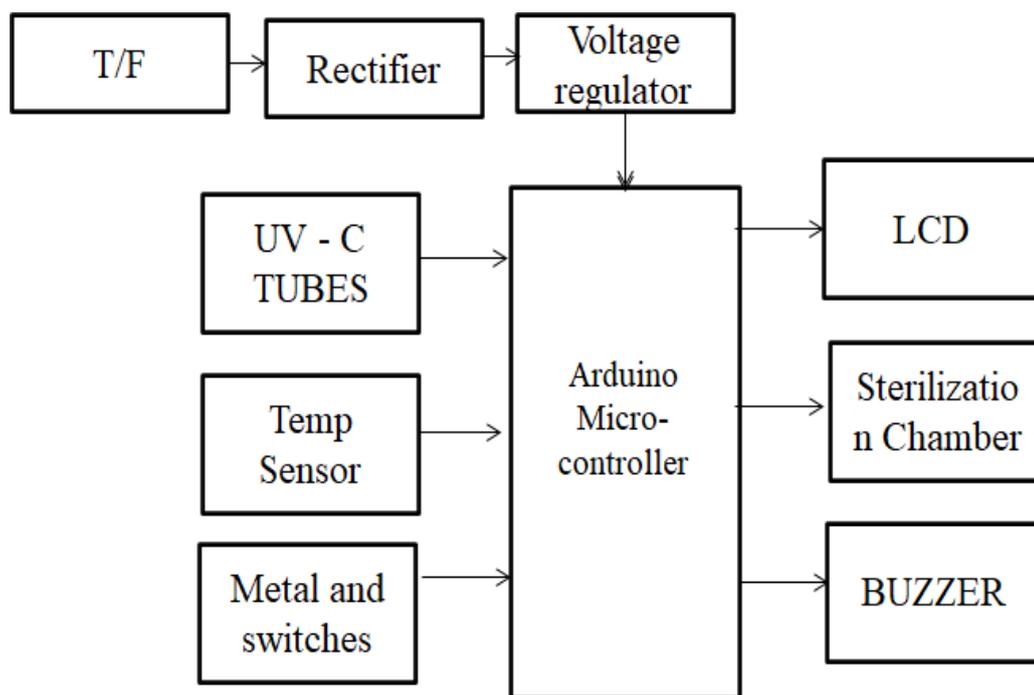


Figure .1. Basic Block Diagram

A wireless sensor network (WSN) is a computer network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. The development of wireless sensor networks was originally motivated by military applications such as battle field surveillance. However, wireless sensor networks are now used in many civilian application areas, including environment and habitat monitoring, healthcare applications, home automation, and traffic control. In addition to one or more sensors, each node in a sensor network is typically equipped with a radio transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery. The size a single sensor node can vary from shoebox-sized nodes down to devices the size

of grain of dust. The cost of sensor nodes is similarly variable, ranging from hundreds of dollars to a few cents, depending on the size of the sensor network and the complexity required of individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and bandwidth. In computer science, wireless sensor networks are an active research area with numerous workshops and conferences arranged each year.

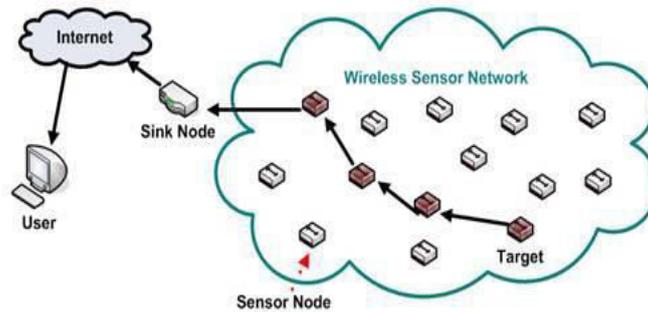


Figure.2. Wireless Sensor Network

Transformer

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op-amp. The advantages of using precision rectifier are it will give peak voltage output as DC; rest of the circuits will give only RMS output.

Bridge rectifier

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4. The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow. The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. This path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3. One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier.

One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit. This may be shown by assigning values to some of the components shown in views A and B. Assume that the same transformer is used in both circuits. The peak voltage developed between points X and Y is 1000 volts in both circuits. In the conventional full-wave circuit shown—in view A, the peak voltage from the center tap to either X or Y is 500 volts. Since only one diode can conduct at any instant, the maximum voltage that can be rectified at any instant is 500 volts. The maximum voltage that appears across the load resistor is nearly-but never exceeds-500 volts, as result of the small voltage drop across the diode. In the bridge rectifier shown in view B, the maximum voltage that can be rectified is the full secondary voltage, which is 1000 volts. Therefore, the peak output voltage across the load resistor is nearly 1000 volts. With both circuits using the same transformer, the bridge rectifier circuit produces a higher output voltage than the conventional full-wave rectifier circuit.



IC Voltage regulators

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

III.SOFTWARE RESULT

Embedded systems programming is different from developing applications on a desktop computers. Key characteristics of an embedded system, when compared to PCs, are as follows. Embedded devices have resource constraints (limited ROM, limited RAM, limited stack space, less processing power) Components used in embedded system and PCs are different; embedded systems typically uses smaller, less power consuming components. Embedded systems are more tied to the hardware. Two salient features of Embedded Programming are code speed and code size. Code speed is governed by the processing power, timing constraints, whereas code size is governed by available program memory and use of programming language. Goal of embedded system programming is to get maximum features in minimum space and minimum time.

Embedded systems are programmed using different type of language

- Machine Code
- Low level language, i.e., assembly
- High level language like C, C++, Java, Ada, etc.
- Application level language like Visual Basic, scripts, Access, etc.

Assembly language maps mnemonic words with the binary machine codes that the processor uses to code the instructions. Assembly language seems to be an obvious choice for programming embedded devices. However, use of assembly language is restricted to developing efficient codes in terms of size and speed. Also, assembly codes lead to higher software development costs and code portability is not there. Developing small codes are not much of a problem, but large programs/projects become increasingly difficult to manage in assembly language. Finding good assembly programmers has also become difficult nowadays. Hence high level languages are preferred for embedded systems programming. Use of C in embedded systems is driven by following advantages it is small and reasonably simpler to learn, understand, program and debug. C Compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.

Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/ microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems. As C combines functionality of assembly language and features of high level languages, C is treated as a 'middle-level computer language' or 'high level assembly language'. It is fairly efficient. It supports access to I/O and provides ease of management of large embedded projects. Many of these advantages are offered by other languages also, but what sets C apart from others like Pascal, FORTRAN, etc. is the fact that it is a middle level language; it provides direct hardware control without sacrificing benefits of high level languages. Compared to other high level languages, C offers more flexibility because C is relatively small, structured language ;it supports low-level bit-wise data manipulation.

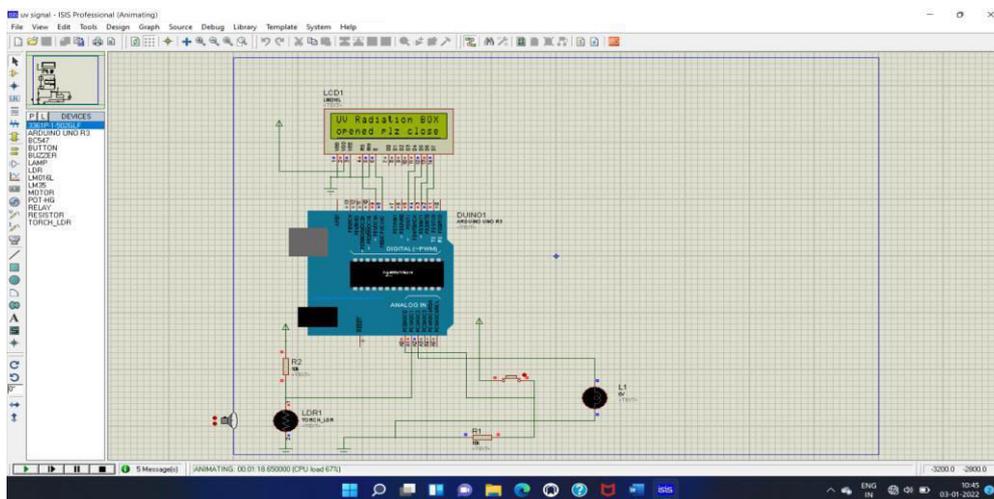


Figure.3. Simulation Result

IV.HARDWAREIMPLEMENTATION

It is a device that can be operated either manually or automatically. This kind of dual mode can enhance the productivity of crop and continuity functioning of the device. Due to this type of special arrangement the device can be operated without any interruption. Malfunctioning of the device can be rectified immediately by any one of the alternate methods. The hardware prototype shows the entire working process of the Covid Disinfection Box in innovative methods.

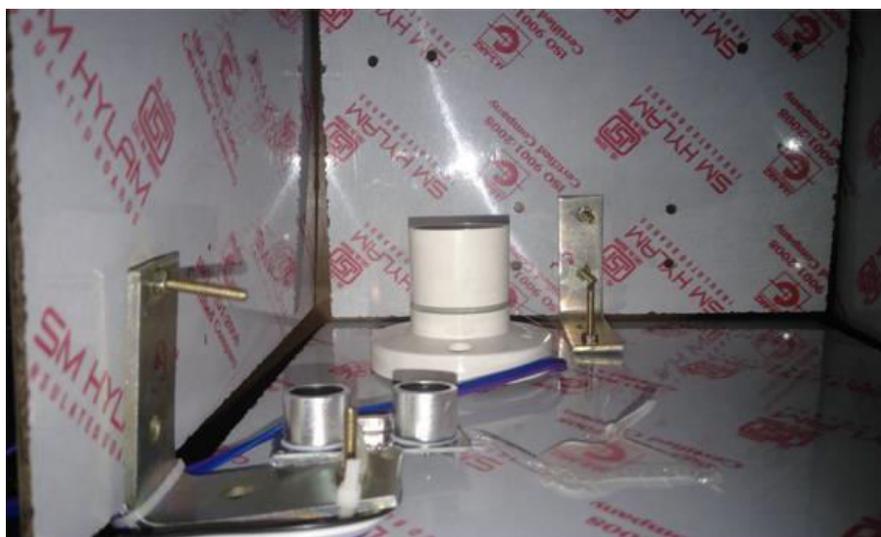


Figure.4. Hardware Prototype

with a smart electronics system powered by an arduino. We design a 360 degree disinfection box using ultraviolet sterilization to solve the issue. The system makes use of 8 UVC tubes to achieve this task. Now UVC has been proven to kill all viruses within a matter of seconds.

V.CONCLUSION

According to the achieved results, the proposed solution is usable for its purpose under certain performance limitations (such as number of processed frames or measurements per second). Moreover, it relies on both open

hardware and free software, being definite and desirable advantage for such systems In future, it is planned to experiment with various deep learning and computer vision frameworks for object detection on Raspberry Pi in order to achieve higher frame rate. Moreover, we would like to extend this solution with environment sensing mechanisms for adaptive building air conditioning and ventilation airborne protection in order to reduce the spread of corona virus indoors especially during summer. Finally, the ultimate goal is to integrate the system presented in this paper with our framework for efficient resource planning during pandemic crisis in order to enable efficient security personnel scheduling and mask allocation, together with risk assessment based on statistics about respecting the safety guidelines and air quality.

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