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Arduino and Bio-Sensor-Based Disinfecting Machine for Sterilizing the Hand Using Far-Uvc

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ABSTRACT: Ultraviolet disinfecting machine (UV clean) is an Arduino-based operating machine that is equipped with Bio-sensor and UV light. The system contains a moving machine with wheels and a station controller to operate the machine. This machine is designed with the motive to kill germs like viruses, bacteria, and other types of harmful organic microorganisms in the environment with ultraviolet light, by breaking down their DNA structure. The most common and popular method to disinfect public places is to spray disinfectant liquids that are 70% alcohol-based. Recently WHO declared that it is harmful to use disinfectant liquids regularly in public places. This can cause a problem in the respiratory system due to their strong scent, cause skin irritation, and may lead to unbalance in the environment. Further, this method is associated with huge material and labor costs on daily basis. So, we have implemented this Arduino-based disinfecting machine cost-effectively to expand the disinfecting process to public places like hospitals, public transport, office spaces, etc. Our machine can also be used to disinfect surfaces, medical suits, medical masks, and other medical pieces of equipment also.

I. PROBLEM STATEMENT

Impacts on Human Health:

On January 30, 2020. WHO (World Health Organization) declared the coronavirus outbreak a global public health emergency. Health professionals recommended using alcohol-based sanitizers and soap for frequent washing of hands. While using alcohol-based sanitizers that lead to dry skin, infection, and poisoning. Hand sanitizers consist mainly of ethanol or isopropyl alcohol (60-95%). It is toxic to sensitive areas like the eye and may lead to blindness.

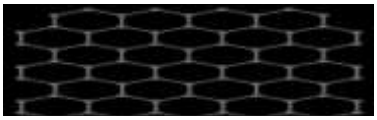
According to data from the American Association of Poison Control Centres, most children under 4 had ingested the sanitizer. These make those children vomit, cough, and have mouth irritation.

II. SYSTEM OVERVIEW

A. Detection Unit:

I) BIOSENSOR:It is a device that converts biological reactions into measurable signals.The transducer converts the biochemical response into a quantifiable signal measured by the digital detector module.

Field-Effect Transistor Based Biosensor: This biosensor helps to detect the spike protein which is displayed on the outside of the virus particle. Here, Graphene is a sheet of carbon a single atom thick. Its structure is like an extended network of benzene rings. The freely mobile electrons in the conjugated pi bonds create a highly conductive material.



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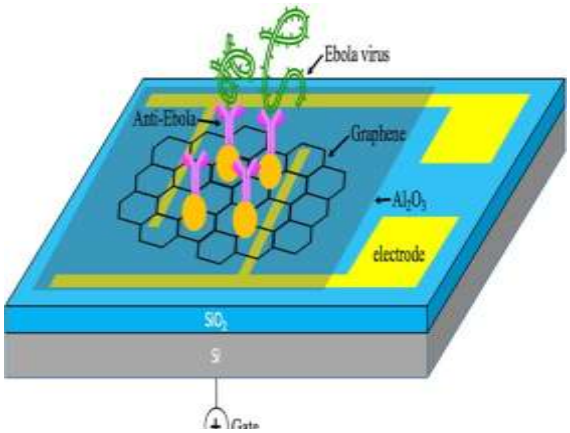
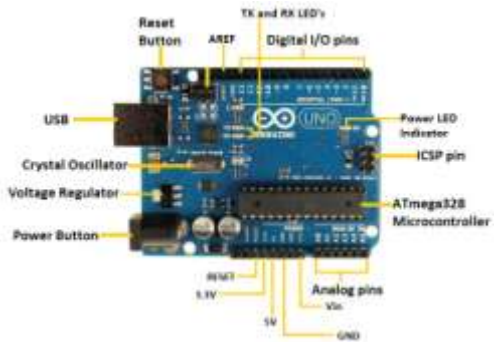


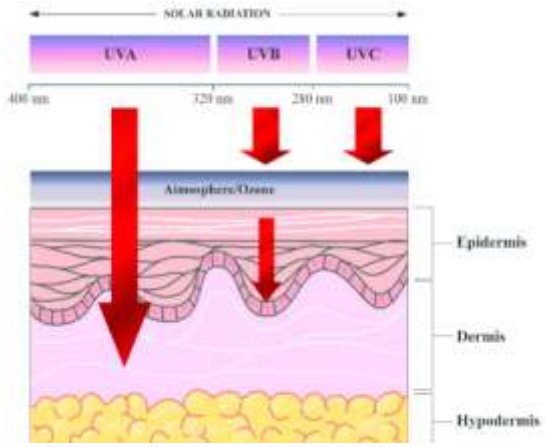
B. PROCESSING UNIT

I) ARDUINO: It is the open-source microcontroller board based on the microchip ATmega328P. It has 14 digital input/output pins, 6 analog Inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICPS header, and a reset button. Simply we can connect it to a computer with the support of a USB cable or battery to get started. USB cable is used to transfer the code to the controller using IDE software. We can use programming languages like C and C++ in IDE.



C. WORKING UNIT

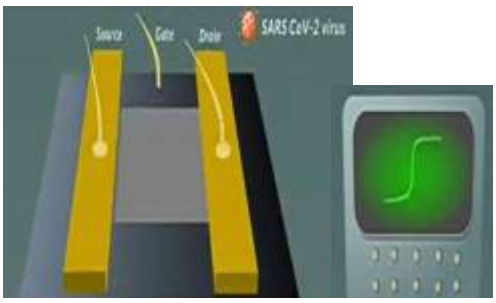
I) FAR-UVC: UVC lamps are often called "germicidal" lamps. It helps to kill germs like bacteria and viruses. It has more energy than radio waves but less energy than gamma rays. Direct exposure to UV can cause health hazards for both skin and eyes. In contrast far-UVC light (207 to 222nm), we can penetrate the body (up to Epidermis) at least.



III. OPERATION UNIT

Working on Field-Effect Transistor Based Biosensor:

We can use the nanofabrication technique to construct a graphene-based transistor. Using the wet transfer method, deposit graphene onto silicon dioxide substrate. Channels were formed in the graphene layer using photolithography and reactive ion etching forming orderly patterns of graphene on the substrate. The metal electrodes were added using a thin-film deposition and a lift-off method. In this way, Graphene bridges the source and drains electrodes. Each transistor measured 100 by 100 microns. At this point, the graphene was ready to be derivatized to make a COVID-19 sensor. Now, we can place our hand on the gate of the transistor. If Voltage is applied across the source and drain electrodes, a current flow through the graphene layer can be measured as a function of the gate voltage.



The higher the concentration of virus results the greater signal that shows in the biosensor.

Here the Arduino board helps to read inputs – greater signal and turn it into an output – activating a far UVC.Ultraviolet light in the range of 222 nm wavelength helps to inactivate pathogens (bacteria or viruses) without damaging human skin and eyes. Like standard UV, far UV is

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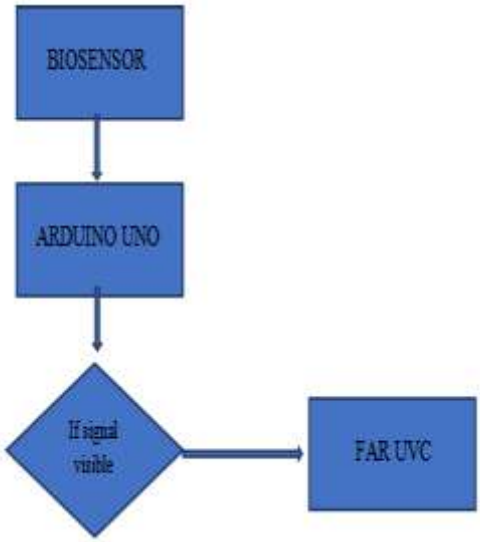
highly effective at breaking protein bonds in the shell of pathogens like SARS CoV-2.

IV. BLOCK DIAGRAM



V. LIMITATIONS

In far UVC, staying within the current regulatory dose limits results in the ambient level of airborne coronaviruses.Field-Effect Transistor Based Biosensor plays poor performance at higher frequencies.

VI. CONCLUSION

This device could help to reduce the use of sanitizers and also this device could help to predict the virus soon and it is eco-friendly. Here there is no need to use chemicals that were used in sanitizers.

VII. REFERENCE

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