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# IOT BASED SMART DOOR HANDLE DISINFECTANT

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**ABSTRACT:**

*In these difficult times it is an extreme need to save ourselves from various harmful bacteria and viruses which are a threat to mankind. Due to this COVID-19 situation people have become more aware of the importance of cleanliness & hygiene and have started giving importance to personal and environmental sanitation. Cleaning and disinfection helps to reduce the incidences of healthcare-associated infections. In the coming years there will be a major need for various methods of eliminating biological organisms that are harmful to health and we will need different methods of sanitation to do so. In our daily lives we come across various contact surfaces such as door knobs which have great possibility of containing harmful bacteria. Thus we have come up with a new door knob sanitizing device which can be installed in various public places which treats the door knobs/handles to make it bacteria free.*

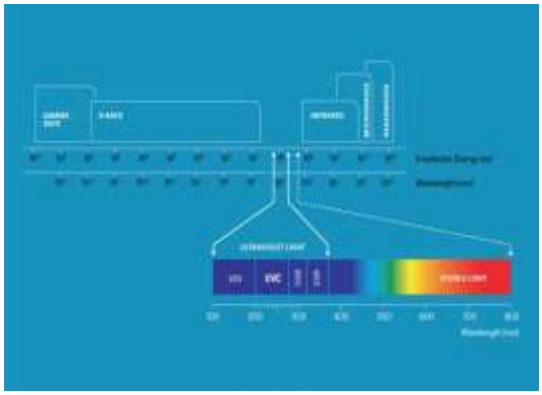
***Keywords****: UV-C Light, Disinfection, Door Knob/Handle, Automation, IOT Device.*

## I. INTRODUCTION:

The corona virus is spreading quickly.As concern has increased,we have seen more people washing their hands and using hand sanitizer than ever before.While there is still a lot we don't know about the new corona virus,SARS-CoV-2, History would suggest that there is probably some transmission from fomites.Every one should be washing their hands and using hand sanitizer but taking efforts to clean the things around us is also important to fight the spread of the virus.A New study suggests that the novel corona virus can survive on some surfaces upto three days,but it varies depending on the material.The study found that the virus could survive for 24 hours on cardboard and upto three days on plastic and stainless steel.It's nearly impossible to keep any thing in the real-world virus-free,But during out breaks like this one it's a good idea to try to minimize the number of viruses on fomites around us.But we do not necessarily need to kill the virus to make ourself safer .Removing the virus can be just as effective and simply washing often-used objects on our hands with soap can do that.During the corona virus pandemic,it is important to clean the objects we touch frequently,like key boards,door handles, table tops and gym equipment .Cleaning objects frequently with a disinfectant is the best way to mitigate the risk of transmission from everyday objects. Environmental cleaning and disinfection are important factors of a comprehensive strategy in order to control healthcare-associated infections, especially in crowded places where there is a continuous contact with door handles . However, studies evaluating the effectiveness of improved cleaning interventions have shown that approximately 5–30% of surfaces remain

contaminated, due to the lack of existing disinfectant methods.There has been a lot of interest in the development of effective and more comprehensive environmental disinfection strategies.One of the most widely used methods for killing harmful bacteria is exposing them to Ultraviolet radiations typically between 200 to 280nm range using UV-C light. We have used similar technology in building our device which will disinfect the door handles and effectively stop the spread of bacteria through door handles.

## II. LITERATURE REVIEW :



Ultraviolet light is a form of electromagnetic radiation which is transmitted in the form of waves or particles at different wavelengths and frequencies.UV light falls in the range of between(180-280nm).It has frequencies of about 8x1014 to 3x1016 cycles per second,orhertz(Hz).Classification of UV light UV is generally divided into three sub-brands:

- UV-A,ornearUV(315-400nm)UV-B,
- UV(280-315nm)UV-C
- farUV(180-280nm)

UV-C light is a short wavelength light which is used for sanitization purposes.UV-C light deactivates the DNA of bacteria,virus and other pathogens so that it is unable to function or reproduce.When the organism tries to reproduce, it dies. Many research studies and reports say that when any biological organisms are exposed under a deep UV light in the range of 200nm to 300nm they are absorbed by DNA,RNA,and proteins. Absorption by proteins results in bursting or breaking of cell Walls and hence results in death of the organism while absorption by DNA or RNA Causes in activation of the DNA or RNA and hence the replication process is disrupted.

## III. MATERIAL AND MANUFACTURING PROCESS :

Looking at the use and purpose of this device and also mounting of the device on the door we have found out that this device does not undergo any major forces. Hence it would not be practical to use stronger materials but at the same time the material should be long lasting, durable, vulnerable and also cost-effective. We have chosen Polypropylene as our material for this device. Polypropylene (PP) is a thermoplastic polymer and due to its properties it is used in various applications. PP has good resistance to environmental stress cracking which helps it for its longer life. PP is also used widely in medical industries because it exhibits high chemical and bacterial resistance. Also, PP exhibits good resistance to steam sterilization. These properties of PP are highly suitable for our need as our sole purpose is to make the door knob/handle bacteria free. PP can be processed virtually by

many processing methods such as Injection molding, Extrusion, Blow Molding and General-Purpose Extrusion. For our application Injection molding suites our requirements the best. Hence, we have selected injection molding method for manufacturing our product.

Injection Molding

 Melt temperature: 200-300°C  Mold temperature: 10-80°C  Drying is not necessary if stored properly  High mold temperature helps to improve brilliance and make the product aesthetically good  Mold shrinkage lies between 1.5 and 3%, which depends upon the processing conditions, rheology of the polymer and thickness of the final product.

## IV. WORKING :

This project comes under the domain of IoT.The Automatic Door Knob/Handle sanitizer uses UV-C LED lights (210-280nm) to generate broad spectrum ultraviolet light , and Infrared Proximity Sensors.Automatic UV technology is dependent on the distance between the light source and the surface to be disinfected.According to the Inverse square Law,the doubling of distance between the light and the surface to be disinfected will quadruple the time required for disinfection of frequently touched surfaces ie:door knobs and handles,this device uses a1minute disinfection cycle with light approaching the knob from multiple angles in order to cover maximum surface area to achieve optimal disinfection.It is recommended that the device be placed properly and can at maximum can be 15 centimeters away from the knob/handle surface.

When a person uses the door knob/handle,the movement is detected by the IR sensors and the circuit is triggered,red light is switched onto indicate the person has to wait,the control unit is started to disinfect the door handle,until then the Person is not allowed to touch the door.Once the disinfection process is over,green light is turned on to allow the person to touch the door handle and enter the room.As soon as the person approaches the door the one-minute sanitation cycle begins,it is recommended that the door knob is unused during the disinfection process,if motion is detected the sanitation cycle is stopped and started again once no motion is detected.When the UV-C light is projected on the door knob/handle it breaks apart the DNA bacteria which stop bacteria so that the bacteria are unable to function or reproduce.Apart from this the disinfection cycle is triggered automatically irrespective of any one using the door knob.The device itself has been fitted with hinges to ensure proper adjustment.

## V. DESIGN :

Designing is one of the most important aspects while developing any new product. Various factors were considered while designing this device such as safety, aesthetics, ergonomics etc. Design of this device is such that the UV-C LEDs are placed at a distance which can disinfect the door knob/handle very efficiently and also the UV-C LED light can cover the overall surface of the door knob/handle. UV-C LED lights are directly projected on to the door knob/handle and there is minimal exposure anywhere outside the targeted surface as it can have minor ill effects to human skin. The device is adjustable and can be adjusted as per the size of the door knob/handle and hence can be installed on any door knob/handle. The design of the device is also aesthetically pleasing.

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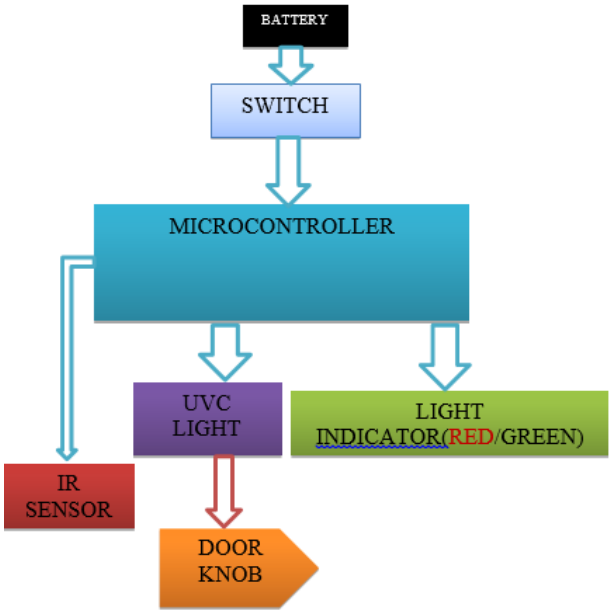
## VI. DESIGN OBJECTIVE :

To detect the entrance of a person near the door within a proximity of 1m.

To activate the control unit to disinfect the door handle automatically when a person is identified near the door.

## VII. ARCHITECTURE :




## VIII. COMPONENTS USED :

- UV-C LIGHT

We have used UV-C LEDs in this device. Function of UV-C LED Light is to disinfect the door knob/handle by projecting the light on the surface to be disinfected. UV-C LED that can be used for this device has following specifications:

| | |
|---|---|
| **Wavelength (nm)** | 275±2 |
| **Model** | TY-UV275nm SMD |
| **Encapsulation mode** | SMD |
| **Optical power [mW]**<br>**IF=20ma** | Min 1.0<br>Max 1.5 |
| **Forward Voltage VF[V]** | Min 5.50<br>Max 6.00 |
| **Beam Angle** | 120-140 |

- IR SENSOR

We have used IR Proximity Sensor for this device. The function of an IR sensor is to detect the motion on the door knob/handle. It has a range of 10-15 cm with input supply voltage of 5V DC. It is operated at 6.5V and has output voltage for logic one(+3.5V) & logic Zero (0.0V).

Fig-1: IR Proximity Sensor

- MICROCONTROLLER

We have used Arduino Uno as our microcontroller. This microcontroller will help the device to control all the necessary functions as per the instructions given. The microcontroller which can be used have following specifications:

| | |
|---|---|
| **Microcontroller** | Atmel ATmega328 SMD package |
| **Operating Voltage (logic level)** | 5 V |
| **Input Voltage (recommended)** | 7-12 V |
| **Input Voltage (limits)** | 6-20 V |
| **Digital I/O Pins** | 14 (of which 6 provide PWM output) |
| **Analog Input Pins** | 8 |
| **DC Current per I/O Pin** | 40 mA |
| **Flash Memory** | 32 KB (of which 2KB used by bootloader) |
| **SRAM** | 2 KB |
| **EEPROM** | 1 KB |
| **Clock Speed** | 16 MHz |
| **Dimensions** | 0.70” x 1.70” |

Fig-2: Arduino UNO

## IX. CONCLUSION :

The device we have built will be able to work efficiently to disinfect door knobs/handles and can improve the results of reducing germicidal issues. This device will help in reduce health-care associated infections rates to a good extent.

Hence, this device can be used in places like hospitals where there is a need to disinfect the surfaces and also in public places like railway stations, airports, offices etc to eliminate the surface bio burden and hence resulting in improved hygiene and reduction in infections.

## REFERENCES

[1] Carling P.C., Huang S.S. Improving healthcare environmental cleaning and disinfection. Infect. Control Hosp. Epidemiol. 2013;34:507–513. doi: 10.1086 /670222. [PubMed] [CrossRef] [Google Scholar]

[2] Vickery K., Deva A., Jacombs A., Allan J., Valente P.,Gosbell I.B. Presence of biofilm containing viable multiresistant organisms despite terminal cleaning on clinical surfaces in an intensive care unit. J. Hosp. Infect. 2012;80:52–55. doi: 10.1016/j.jhin. 2011.07.007. [PubMed] [CrossRef] [Google Scholar]

[3] https://www.klaran.com/klaran-university/about-uvc

[4] https://omnexus.specialchem.com/selection-guide/polypropylene-pp-plastic

[5] https://www.nature.com/articles/s41598-020-67211-2

[6] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6801766/

[7] https://www.instructables.com/id/Coding-Timers-and-Delays-in-Arduino/

[8] https://www.arduino.cc/