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J Component Project
PHY - 1901
UV DISINFECTION USING AI

SUBMITTED BY: -

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Submitted to: -

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ABSTRACT:

- 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 us from everything we touch.
- We cannot apply sanitizers on fruits, vegetables, packed food, batteries, etc. we buy from outside or we can't sanitize files or paperwork that doctors exchange with patients or employees exchange with each other.
- Many researchers are working on multiple aspects of the COVID-19 pandemic including disease detection, treatment, and Vaccine development.
- Well, we solve this huge problem with an Automatic UV Disinfection System with an automatic conveyor. Now UV C Has Been Proven to kill Viruses within a matter of seconds.
- UV C is Used to kill bacteria and germs from the surface of Products like fruits, vegetables, etc., and this proposed system addresses these challenges comprehensively.
- The proposed system is unobtrusive during its operation and can be operated even in the presence of people in the living spaces.

INTRODUCTION:

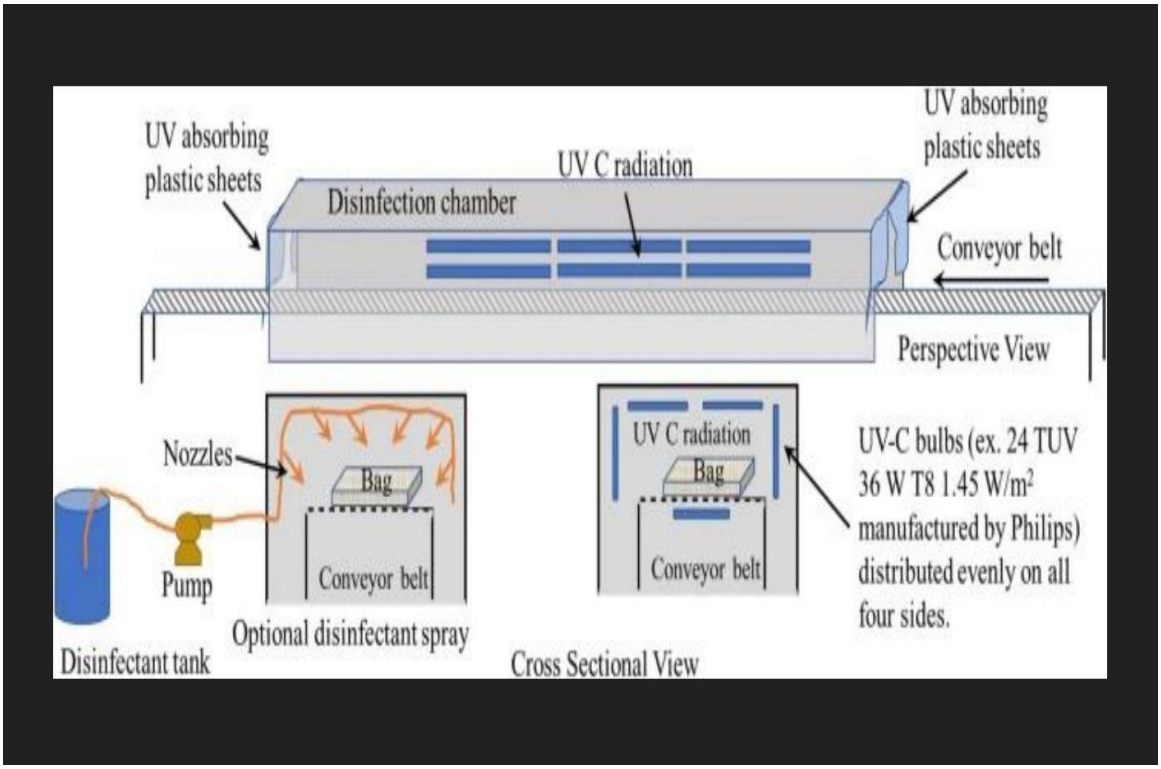
- The chief goal of the proposed fomite disinfection system is to minimize the spread of Wuhan corona virus (COVID-19) by disinfecting the surfaces of the luggage.
- The disinfection systems are very common and use one of the many of the disinfection strategies. Based on these characteristics, ultraviolet-C (UV-C 100–280 nm) radiation is the preferred disinfection agent.

- Non foaming soap solutions are also very effective against coronavirus which has a lipid membrane (Gibbens 2020). □ The UV-C based disinfection technology is commonplace and is applied widely to treat surfaces in hospitals, and water disinfection systems, among many applications (Philips 2020a; ICROCHEM laboratory 2020).
- The UV-C based disinfection works by damaging the DNA/RNA of bacteria and viruses preventing their replication .Several commercial products use UV-C based disinfection technologies. For example, almost all domestic reverse osmosis systems have a UV module for an additional level of disinfection, and many of the operation theatres and laboratories use UV-C-based surface sterilization strategies.

FOCUS OF IMPLEMENTATION:

- Here mainly we are focusing on Health care centres, Airports and Train/Bus Stations
- For Passenger Luggage at Airports and Train/Bus Stations
- For Hospital UV Disinfection
- Schools/Universities etc

MODEL FOR AUTOMATIC DISINFECTING FOR PASSENGER LUGGAGE:



- This proposed system addresses these challenges comprehensively. The proposed system is unobtrusive during its operation and can be operated even in the presence of people in the living spaces. The system design is very modular, has low capital and operating costs.

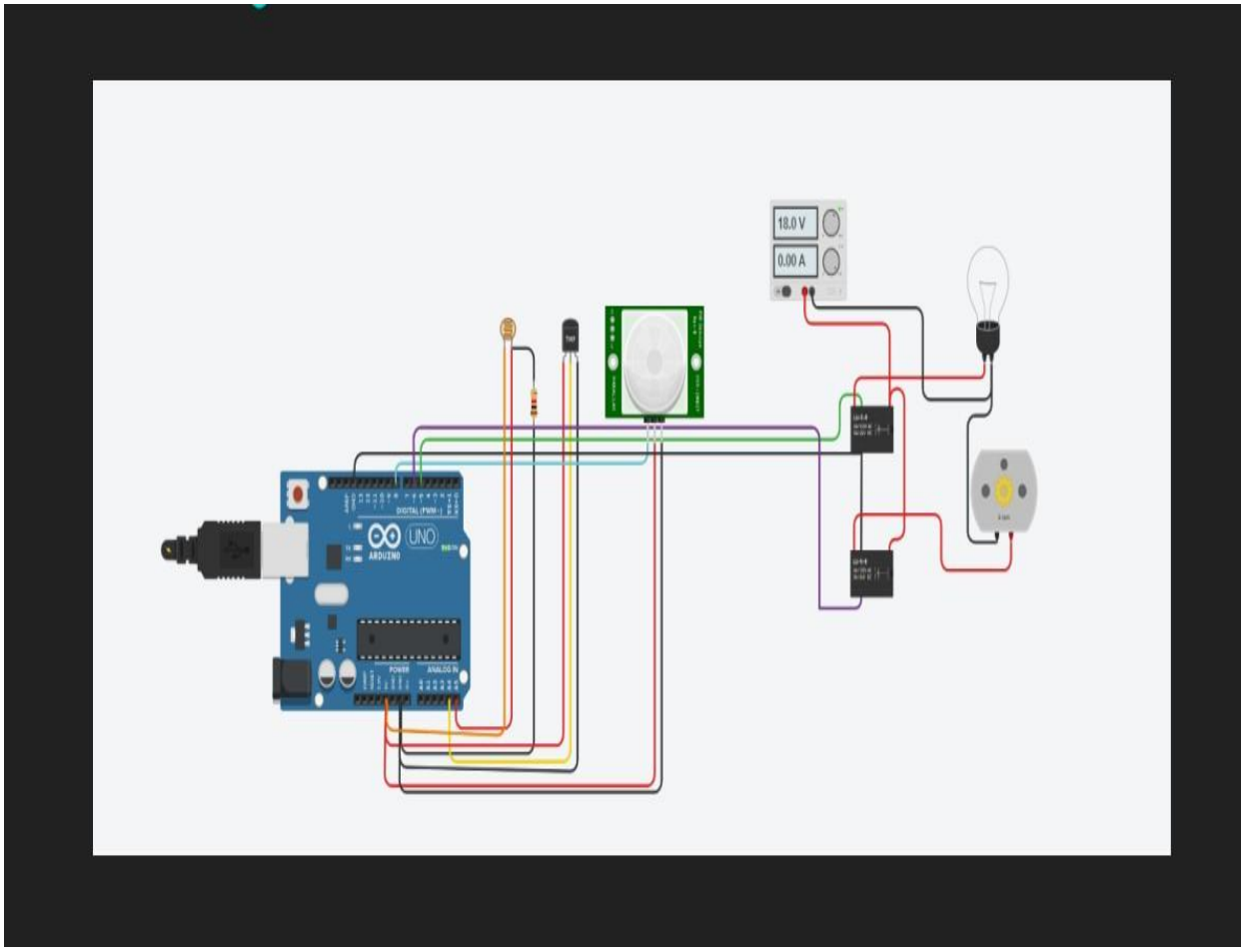
- Fomite disinfection system is modelled on a tunnel-type architecture commonly seen in airports for screening passenger baggage. The use of UV-C radiation for passenger luggage disinfection can be augmented with a spray system with a nonfoaming soap solution towards the end of the tunnel.

- The entry/exit of the tunnels is covered with UV-absorbing flexible plastic curtains. The technology can also be adopted by organizations such as India Posts, Flipkart, and Amazon which handle high volumes of individual packages at their distribution centres.

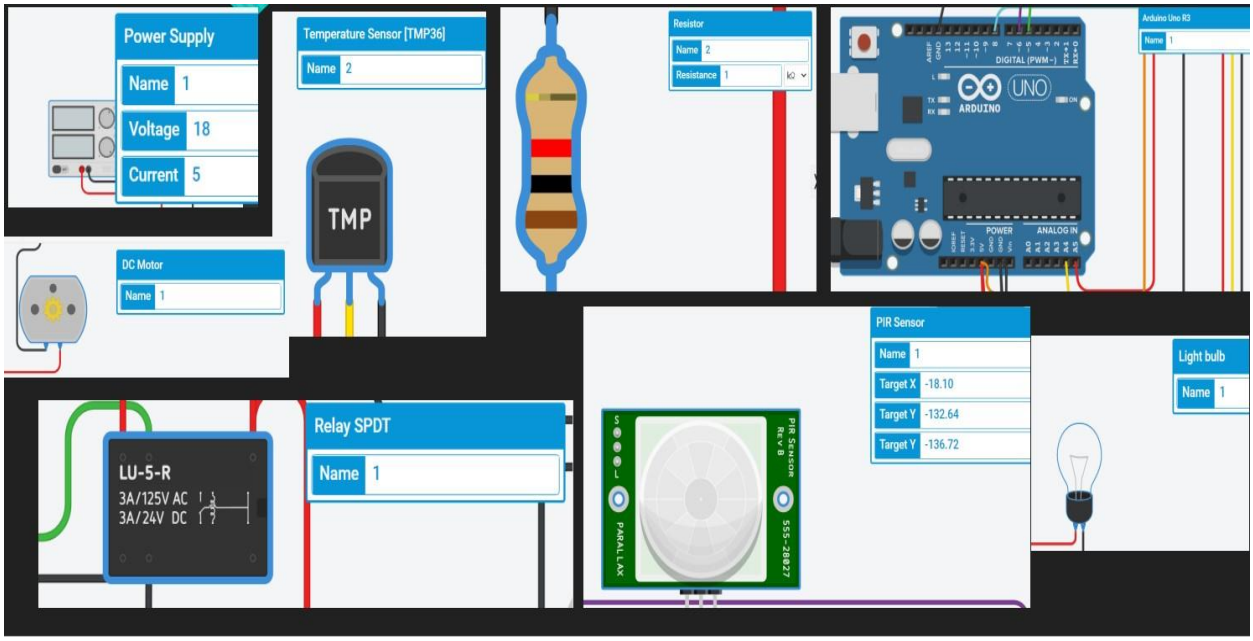
Implementation:

- Here we used Thinker Cad for Implementing and Testing the Hardware.
- If it runs successfully according to the requirements then it can be developed in real-time.

OVER ALL SYSTEM LOOK:



MODULES USED:



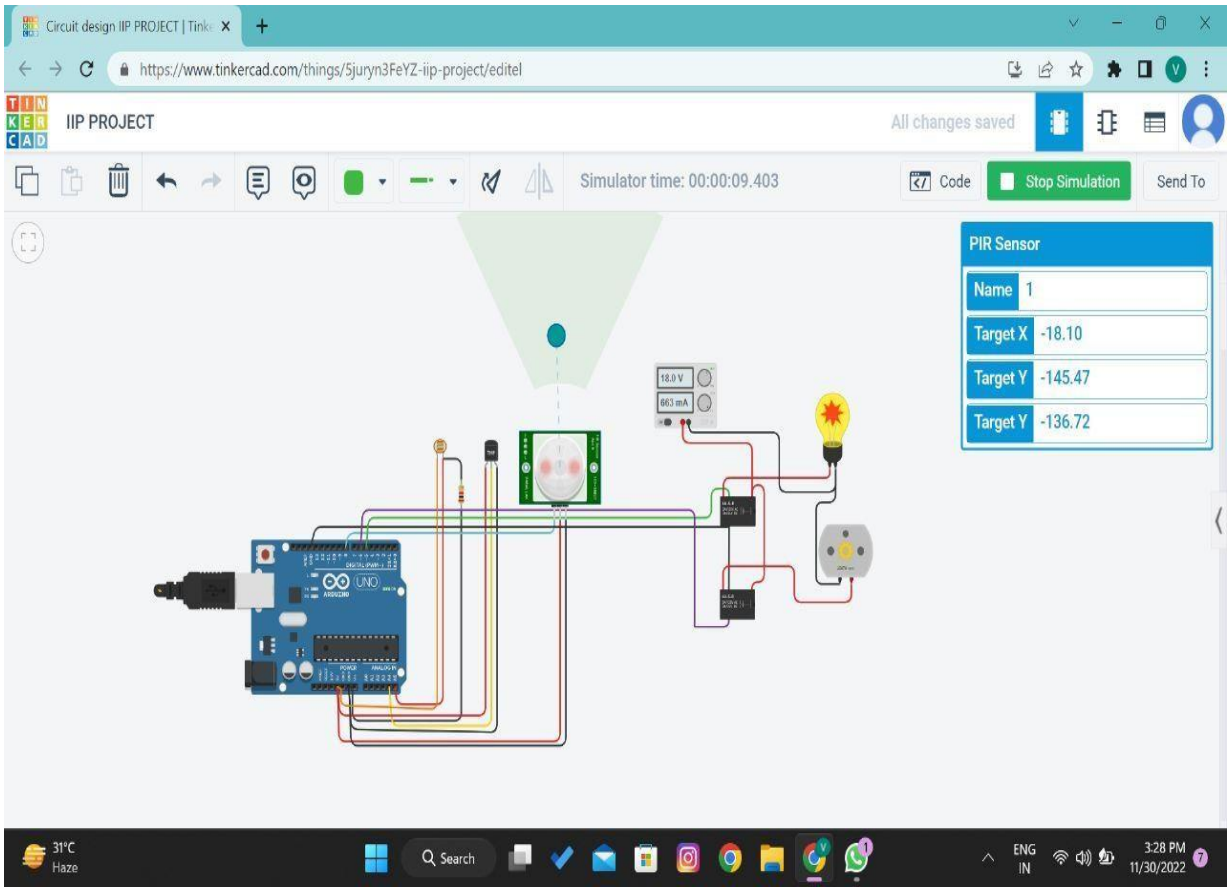
CODE:

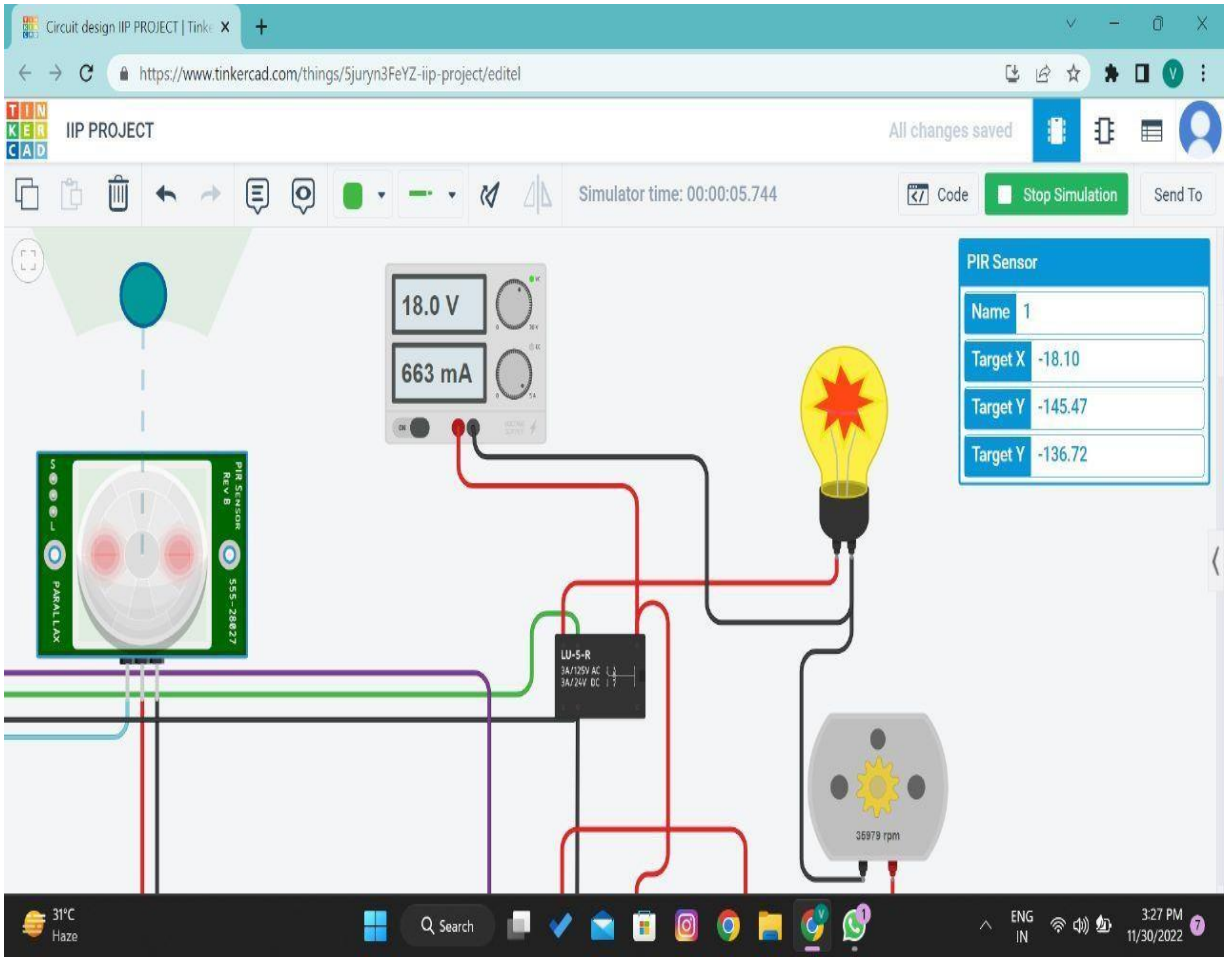
```
float x,y,z,temp; void
setup()
{
  pinMode(8, INPUT);
pinMode(5, OUTPUT);
pinMode(6, OUTPUT);
pinMode(A5, INPUT);
pinMode(A4, INPUT);
```

```
Serial.begin(9600);
} void loop() {   x=
digitalRead(8);   y=
analogRead(A5);   z=
analogRead(A4);
  Serial.println(x);
  Serial.println(y);
Serial.println(z);   temp =
(double)z / 1024;
temp = temp * 5;
temp = temp - 0.5;
temp = temp * 100;
if ( (x>0) )
  {
    if ((y<550)&&(temp>30))
    {
      digitalWrite(5, HIGH);
digitalWrite(6, HIGH);
    }
    else if((y<550)&&(temp<30))
    {
      digitalWrite(5, HIGH);       digitalWrite(6, LOW);
    }
```

```
    else if((y>550)&&(temp>30))
    {
      digitalWrite(5, LOW);
digitalWrite(6, HIGH);
    }
    else if((y>550)&&(temp<30))
    {
      digitalWrite(5, LOW);
digitalWrite(6, LOW);
    }
}
else
  {
    digitalWrite(5, LOW);
digitalWrite(6, LOW);
  }
}
```

WORKING SCREENSHOTS: -

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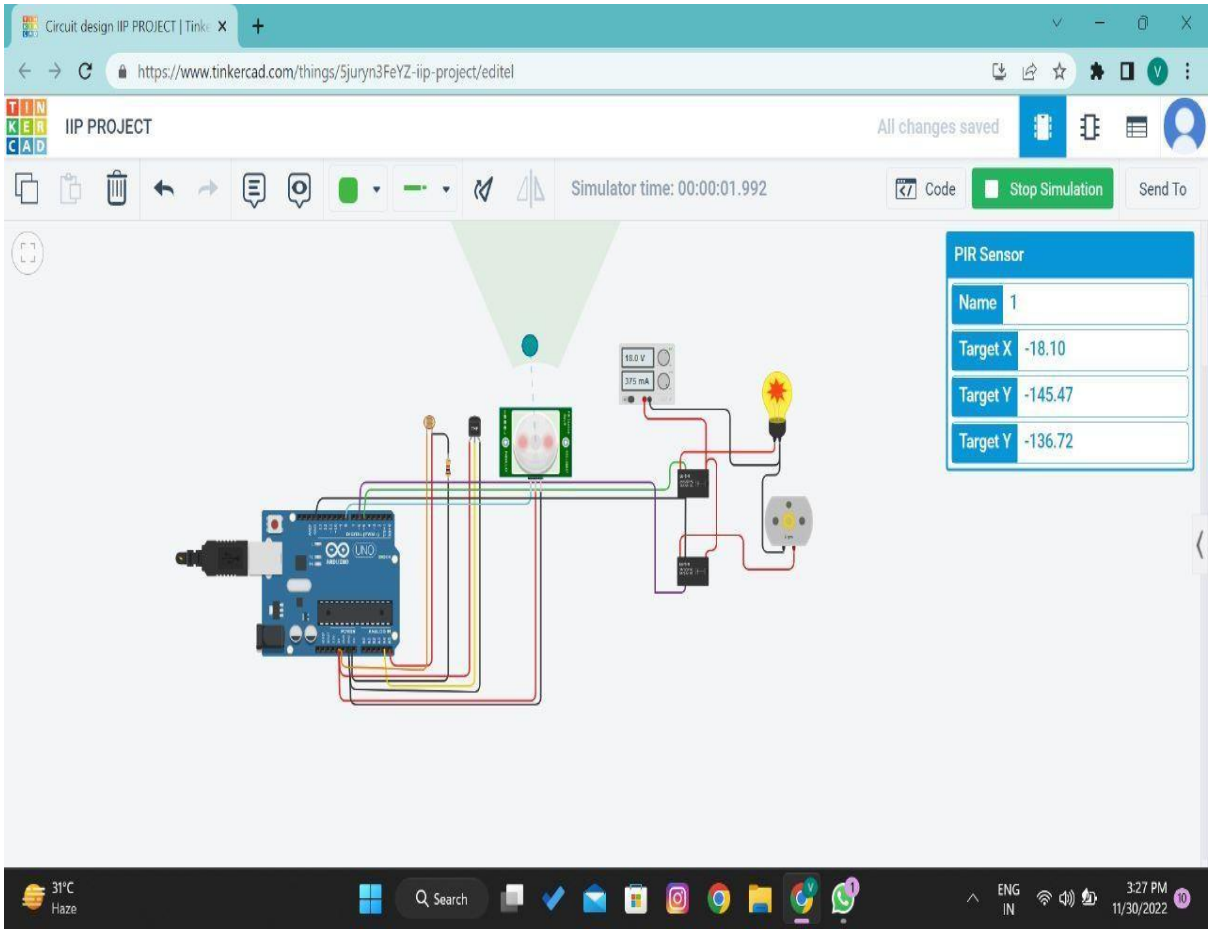
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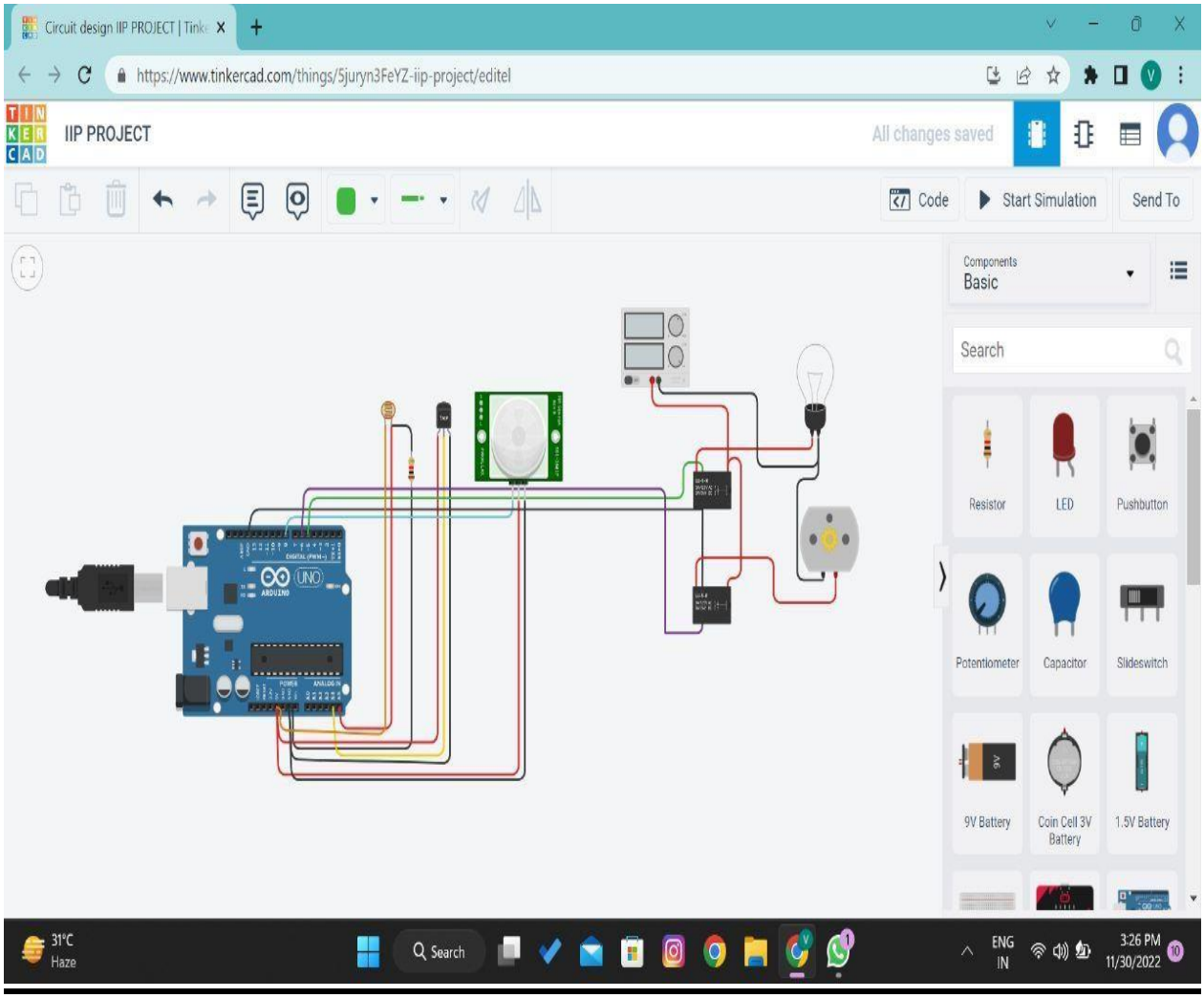

CHALLENGES:

Challenges in Sterilizing Hospital Rooms and Surfaces:

- Many challenges exist in preventing the spread of infection in hospital rooms and surfaces. Disease outbreaks have been traced back to many sources such as thermometers, blood pressure cuffs, sinks, and counters in patient rooms and computer keyboards. This puts hospital staff at risk of contracting and spreading dangerous pathogens.
- Hospital staff are expected to thoroughly clean patient rooms and use disinfectants known to kill pathogens of a previously

infected patient. Some chemical disinfectants may require a long exposure time to provide effective sterilization and may not even be applied to all infected surfaces. Cleaning materials themselves such as mops or cleaning cloths may also become a source of transmission, spreading harmful pathogens rather than eliminating them.

- Due to these challenges facing the healthcare environment with ineffective chemical treatments and the resistance of certain pathogens, it is imperative to incorporate enhanced sterilization with hospital UV disinfection.

There are Two Challenges with the existing commercial products as applied to the fomite disinfection:

- Most of the designs available commercially for the disinfection of hospital rooms and other living spaces are open systems and require the movement of people out of the room when the UV-C disinfection process is carried out. This presents a practical problem when applied to the disinfection of fomites and reduces the overall effectiveness of the systems as they need to be operated with continuous supervision.

- A second challenge with the existing systems is that most of the systems are designed outside India and are generally expensive when imported. In a price-sensitive market such as India and many other developing countries, the economic effectiveness of the strategy is essential.

- Additionally, it is desirable to have a system that has a wide range of uses even after addressing the immediate need for the COVID-19 pandemic.
- There are very few professional open-source designs of any disinfection device that uses UV-C radiation for living spaces.

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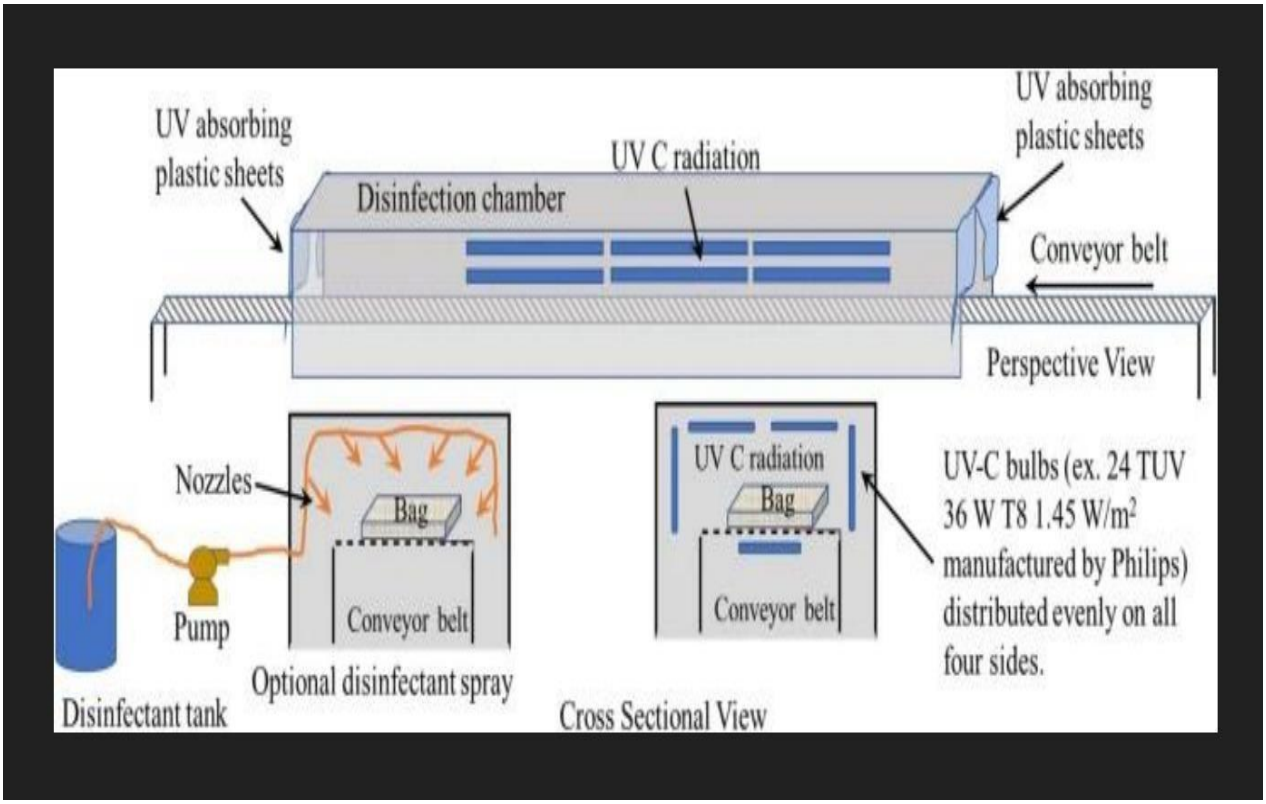

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Automatic UV Disinfection Systems for Hospitals:

UV disinfection in hospitals is gaining traction due to the high rate of effectiveness and also because of the ability to automate the sterilization process. Many types of hospital UV disinfection systems are available such as:

- Stationary solutions such as UVC lamps in light fixtures, overhead doors, and doorways
- UVC lamps in HVAC systems to sterilize the air
- UVC lamps in water systems for clean and sterile water supply Automated hospital UV disinfection systems provide an invaluable benefit to protect patients and staff as well as costeffective operation with no required labour.

- Activating automated UV disinfection in operating rooms after surgeries and prior to new patient arrivals adds a protective layer to manual cleaning and can reach into odd places that may get overlooked during manual cleaning processes.

- Hospitals can incorporate automated UV disinfection systems in operating rooms, patient rooms, labs, storage facilities and on equipment surfaces. UVC germicidal lamps offer an enhancement to traditional cleaning methods and are proven to be more effective than cleaning with chemicals alone.

HOW AUTOMATED LUGGAGE DISINFECTOR WORKS?

- FOR AUTOMATED LUGGAGE DISINFECTOR

The system consists of a roller-based conveyor carriage moving inside a chamber which is configured with a UV bath of calibrated dosage.

- The type of UV used for the purpose is Far-UVC, which according to literature is effective against Coronavirus.

- When an object enters near to the system the conveyor belt will automatically turn on and then the UV Light will also turn ON.

- It will turn ON when an object is close to the system.

•The items to be disinfected are carried on the conveyor to the chamber such that there is scanning and sanitization of the item all around the object surface.

•For maintaining the required exposure of the item to the UV rays in all areas as per the required intensity and time for the sanitization process, the movement of the conveyor is automated, along with necessary electrical and mechanical safety interlocks.

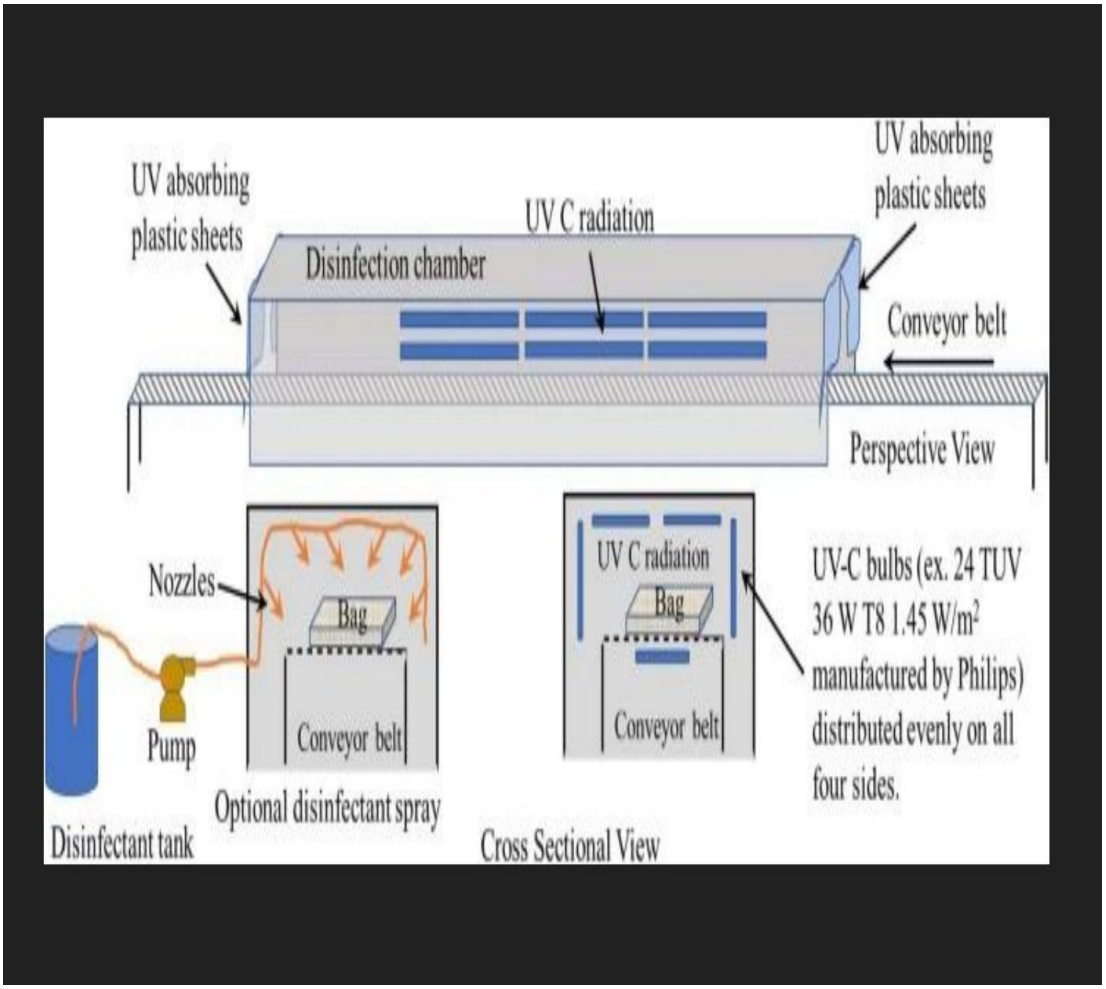
UV LIGHT FOR AIR CONDITIONING SYSTEM:

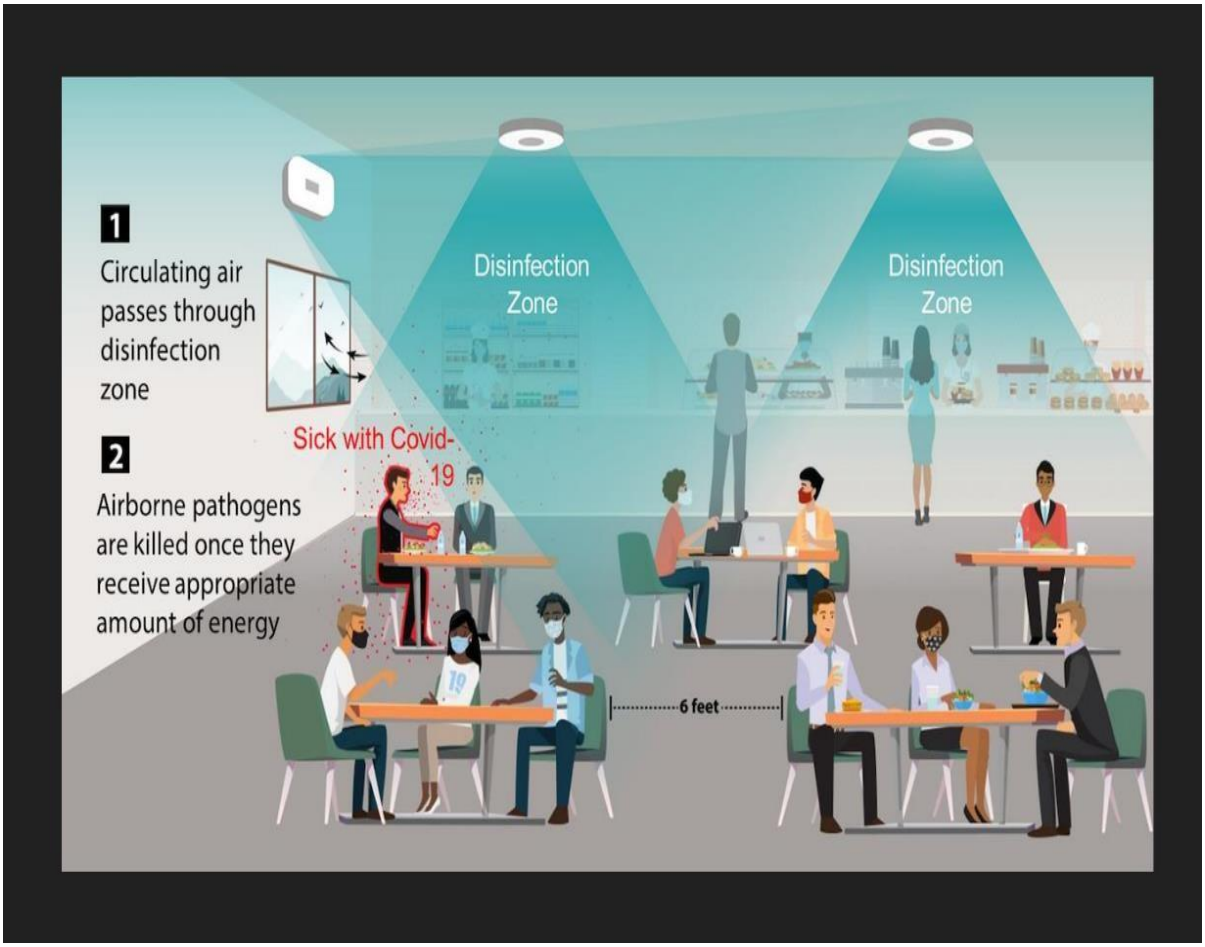
- By installing an HVAC UV light, you can eliminate mould and mildew, kill viruses and bacteria, and reduce odours, all of which will improve the quality of your indoor air.

- Additionally, UV lights increase the efficiency of your HVAC.
- The UV lamps will clean the coils and air that passes through the HVAC system naturally.

- For Installation we will be using REME-HALO UV Light it has a distinctive design that is able to actively reduce pollutants.
- Designed to combine a UV-C light on an advanced catalyst, the REME-HALO creates low concentrations of gaseous hydrogen peroxide in the air that disperses throughout your space.


UV-FLOW...C-NX
Contaminated Air
Aria contaminata
Purified air
Aria Purificata


UV absorbing plastic sheets
UV C radiation
UV absorbing plastic sheets
Disinfection chamber
Conveyor belt
Perspective View
Nozzles
Bag
Conveyor belt
Pump
Optional disinfectant spray
Disinfectant tank
UV C radiation
Bag
Conveyor belt
Cross Sectional View
UV-C bulbs (ex. 24 TUV 36 W T8 1.45 W/m² manufactured by Philips) distributed evenly on all four sides.



Which Type of UVC we are Using For Indoors:

Here we are using Far- UVC which is lower range of wavelengths (between 207 and 222 nm) for disinfection. Most far-UVC products contain 222 nm light.

•Safe for skin and eyes – According to most research, far-UVC products are safe for skin and eyes. Far-UVC does not penetrate the outer layer of skin or eyes, so it doesn't cause any tissue damage.

•Constant disinfection – Because far-UVC is safe for skin and eyes, products can run constantly. They can work at all times to kill pathogens like viruses and bacteria so you are never starting from

ground zero. UV-C products only target germs during a timed cycle when no one is in the room.

Conclusion:

Therefore by using these systems, we can prevent any type of Harmful viruses, The system is developed so that we can use it in Airconditions, Luggage Disinfection. A proper UVC Bulb is taken which does not affect The Humans.

LINK FOR THE RECORDED VIDEO (FINAL REVIEW): -

https://drive.google.com/file/d/1v72dvfJX_R8i19IWOkvclTpuVMzMWZ3r/view?usp=share_link

LINK FOR THE FINAL PPT: -

https://drive.google.com/file/d/1iKgiGW_qdT-CEfMfq1GIn7HsdWNq9Niq/view?usp=share_link

IMPLEMENTATION LINK: -

https://www.tinkercad.com/things/5juryn3FeYZ-iip-project/editel