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UVC Hand Sanitizer with Monitoring System

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Abstract: This project is developed to overcome problems in the community regarding other alternatives to sanitising hands. Few people face the issue of applying liquid sanitiser as their daily cleaning mechanism. Hence, the development of UVC sanitiser is done to provide people with a new method of hand sanitising by using UVC light. Furthermore, previous research is also referred to prove the effectiveness of UVC light in killing germs. It has been done to ensure this type of light is effective and safe to be used on human hands. As the device will be commercialised to retailers, some features will be added to increase the device's value. Moreover, a visitor counter system is also one of the device features. The system can track the number of visitors in the retail and automatically stop new entrances if the limit quantity has been reached. Besides, a dashboard for component functionality tests is built to help the user troubleshoot the device quickly. The user can test all the input and output component signals in the dashboard layout using a mobile phone. In conclusion, this device contains many features that benefit its target user differently. A new alternative for sanitising hands will help many who are allergic to common sanitisers.

Keywords: UVC Hand Sanitizer, Monitoring System, Visitor Counter

1.0 INTRODUCTION

In December 2019, there was a cluster of pneumonia cases in the city of Wuhan in China. Some of the early cases had reported visiting or working in seafood and wet market in Wuhan. The investigation found that the disease was caused by the newly discovered coronavirus. The disease was subsequently named covid 19. Covid 19 spread within China and to the rest of the world. On 30 January 2020, the World Health Organization (WHO) declared the outbreak a public health emergency of international concern. We will take a look at what is currently known about covid 19.

So what is a coronavirus? Coronaviruses are a large group of viruses. They consist of a core of genetic material surrounded by a lipid envelope with protein spikes. This gives it the appearance of a crown. Crown in Latin is called Corona, and that is how these viruses get their name. There are different types of coronaviruses that cause illness in animals and humans. In humans, coronaviruses can cause respiratory infections ranging from the common cold to more severe diseases. These include the severe acute respiratory syndrome coronavirus first identified in China in 2003, the Middle East respiratory coronavirus that was first identified in Saudi Arabia in 2012, and SARS covid 2. The name of the virus that causes Covid 19 was first reported in December 2019. It is known that coronaviruses circulate in a range of animals. Sometimes, these viruses can make the jump from animals to humans. This is called spillover and could be due to a range of factors such as mutations in the virus or increased contact between humans and animals. For example, MERS-Covid is known to be transmitted from camels and SARS-Covid from civet cats.

The disease can spread from person to person through droplets. When an infected person releases those droplets through coughing, talking, or sneezing, for example, when close to another person. It can also spread when infected droplets land on objects and when another person touches them and then touches their eyes, nose, or mouth.

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organ failure, and sometimes death. About eighty per cent of cases recover from the disease without needing special treatment. Nevertheless, there are some people who are at risk of serious illness. They include older people or people with underlying medical problems, such as chronic respiratory disease, obesity, diabetes, high blood pressure, heart disease, or cancer.

The infection is commonly diagnosed by a test called Reverse Transcriptase Polymerase Chain Reaction, generally known as PCR. This test identifies the virus based on its genetic fingerprint. There is also a blood test that can check for antibodies against the virus, which may show that someone was infected in the past. The treatment for Covid 19 is mainly supportive care, medicines against the virus are currently under investigation.

There are a number of effective ways to prevent the spread of the disease. These include covering your mouth and nose when coughing or sneezing with a flexed elbow or tissue and throwing the tissue in a closed bin immediately after use. Wash hands regularly with soap and water or an alcohol-based sanitiser. Maintaining at least one-meter distance from people and the appropriate use of masks and personal protective equipment, especially in health settings. It is important to stay home if you are feeling unwell and to call a hotline or medical professional. Nevertheless, if you have a fever, cough, or difficulty breathing, seek medical care early and share your travel history or contact someone unwell with your healthcare provider. In some areas, the government has implemented specific physical and social distancing measures to prevent the spread of the outbreak. It is important to follow their advice. Vaccines to prevent covid 19 are currently under development, and scientists around the world are working hard to make this happen.

2.0 MATERIALS AND METHODS

i. Block diagram

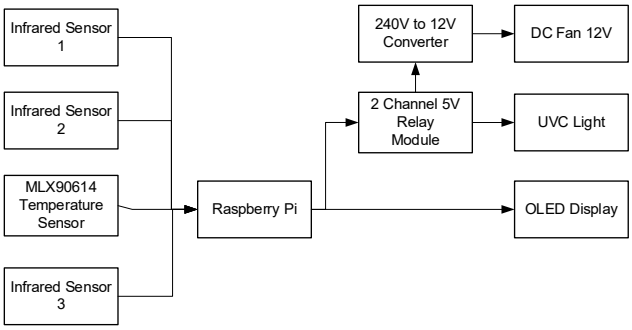

Figure 1; Block diagram of the project

According to the block diagram, this is how all the input, which is the sensors, and output, which is the actuator, connect together. All the sensors and actuator is attached to Arduino UNO. Arduino will act as the main processor, which contains the program of the whole system. Then the Arduino will then connected to a raspberry pi. Raspberry pi is the second microprocessor that will have the structure code of the user interface layout. These two microprocessors will communicate and share data from the sensors. The data will also be displayed in a user interface. Raspberry pi is needed because it has the capability to connect to the internet since this feature does not come with an Arduino microprocessor.

Begin with the temperature sensor, the most important sensor in this system. It will provide the reading of human temperature. Besides, the reading will also be categorised into two different groups, which are healthy temperature and unhealthy temperature. A healthy temperature is a temperature below 37° Celsius. Any temperature reading above this limit will consider an unhealthy temperature. The process of the system will continue if and only if the temperature reading is considered healthy. Otherwise, the system will stop and display disallowed to enter the message.

Then, the process will trigger the actuators one by one. First is the UVC light. It will sanitise the visitor's hand to kill germs and viruses. The air blower will turn on to blow air as a cleaning mechanism for the hand. Lastly, this system will tag the visitor by putting a hand tag. It also helps to count the number of visitors to prevent the crowded area inside the mall.

ii. Flowchart

The flowchart above explains the process of the UVC light sanitiser system. The system operation will be initiated after the temperature sensor scans human body temperature. Human body temperature here is referred to as visitor because this device is designed to control the visitor entering the mall. The system control visitor by differentiating the temperature of a healthy and unhealthy person. The system categorises the visitor by body temperature scan by the temperature sensor. Whoever body temperature below 37 Celsius will be considered as healthy. Otherwise, the person will be considered unhealthy and will not be allowed to enter the premise. A notification will be displayed as a guideline.

Other than that, it also provides sanitising tools. Different from common sanitisers, this device implemented a UVC light as a sanitiser mechanism. It sanitises visitors' hands and blows air to their hands to remove dirt and stain. The UVC light will turn on right after the proximity sensor detect a hand inside the device. Both UVC light and air blower will turn on to begin the

sanitising process. It will take 60 seconds to finish this process.

Furthermore, this UVC light sanitiser system also provides number tagging to a visitor. It will help count the visitor quantity and provide them with hand bracelet tagging. The counter is automated, but the bracelet tagging is self-install. The limit of visitor total quantity can be adjusted accordingly. The number will be counted down after the visitor returns the hand bracelet tagging into its box. After this process, it a worker needs to help sanitise the bracelet manually to ensure a clean and virus-free bracelet tagging.

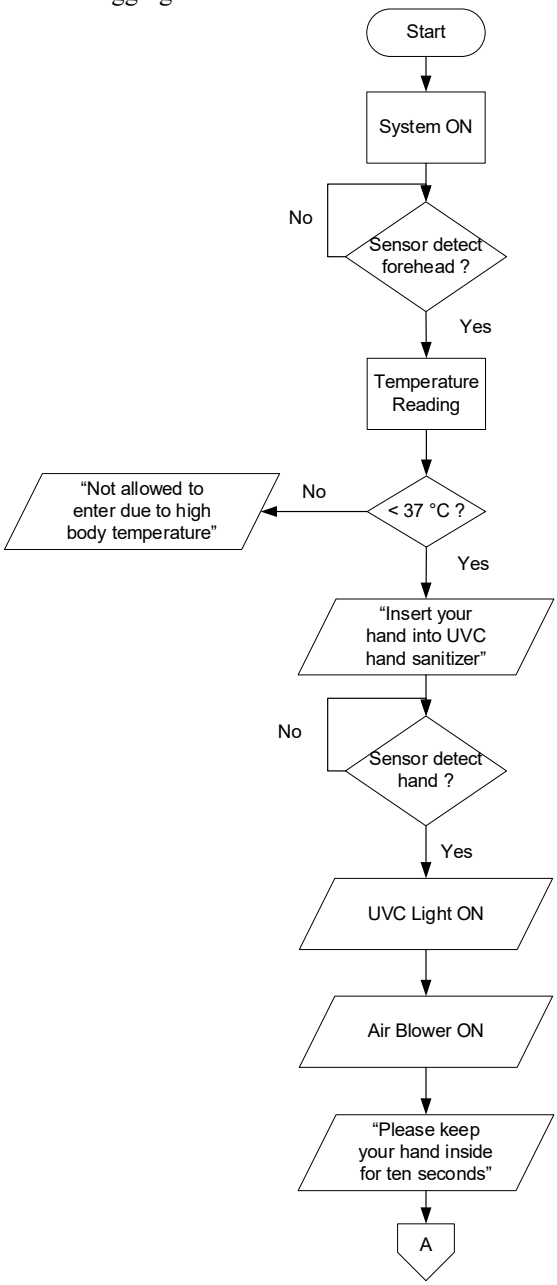

Figure 2: Flowchart of the project

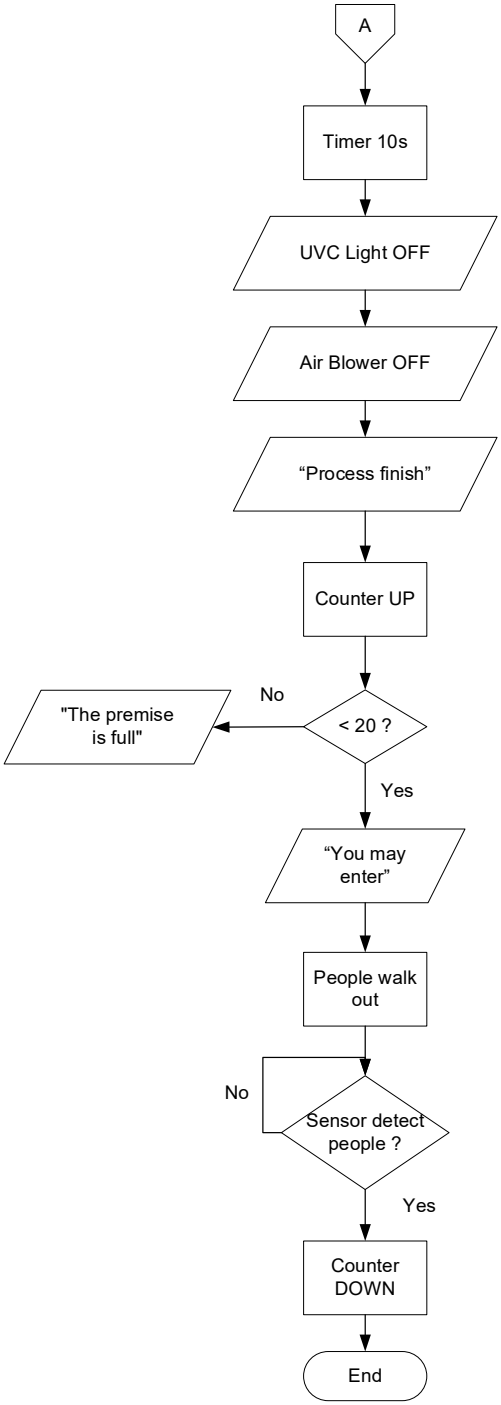

Figure 3: Flowchart of the project

3.0 RESULTS

i. Result 1

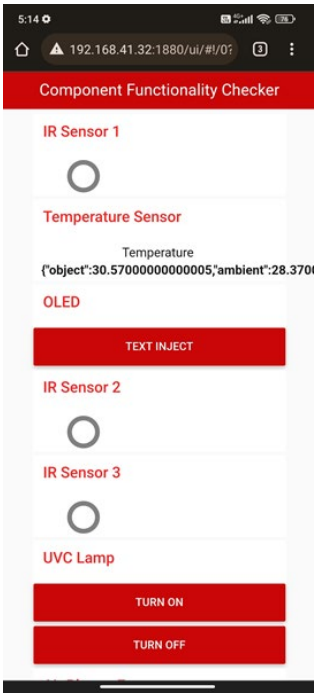

Figure 4: Dashboard Layout

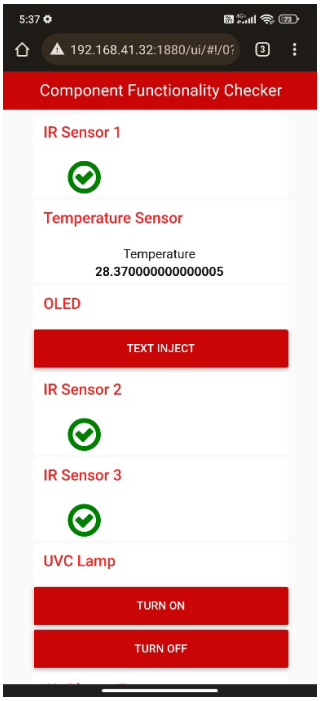

Figure 5: Dashboard Test

The dashboard function as a troubleshooting helper when the system program run into any issue. It designs for the user to test each electronic component one by one. For example, to test infrared sensor 1, the user just needs to put any obstacle in front of the sensor to see if the sensor sends an input signal. The animation of the grey circle will turn into a green tick in the circle. For the temperature sensor, full input data is displayed. Apparently, this is the reason why the value of the temperature sensor cannot be displayed on the OLED screen. To test the functionality of the OLED display, the user just needs to click on the push button. A text was written, "OLED test," which will be displayed on the OLED screen in 3 seconds. For the UVC lamp and air blower fan, a button to turn on and off the component is ready on the dashboard to run testing.

Figure 6: OLED Testing

ii. Result 2

Comparison temperature reading between medical infrared forehead thermometer and MLX90614 contactless infrared temperature sensor.

The distance measured (cm)	5	4	3	2	1	0
Forehead Thermometer	36.2	36.2	36.2	36.2	36.2	36.2
MLX90614 Sensor	30.29	30.31	30.63	30.31	30.81	35.21

The previous table stated the result of temperature reading between two different temperature sensors. One is made for daily usage, and another one is for project development purposes. The forehead thermometer gives a stable reading starting from a measured distance of five centimetres to zero distance. Nevertheless, the MLX90614 sensor cannot produce a stable temperature reading. Despite there is no distance between the sensor and the surface of the forehead, the reading is still not accurate. It reduces one-degree Celsius for no distance temperature measured. And for the other result clearly show a deficit of 5 degrees Celsius on the temperature reading.

4.0 DISCUSSION

This chapter is to conclude the completion of the project and the level of success in achieving the objective of the project. The first objective is to study the efficiency of UVC light in killing the covid 19 virus. There are few past studies that have been made to learn on this subject. Referred to the study, the UVC light has the capability to kill germs, including the covid 19 virus. However, a

specific UVC lamp has enough dose for sanitisation to happen. Time take of exposure and distance to the light source is one of the factors that affect the value of light dose of sanitisation. As for device construction, the lamp use is only to illustrate the working principle. This is because the right UVC light lamp is so expensive.

Secondly, the objective of the project is to develop a prototype of a UVC hand sanitiser with a component functionality monitoring system. This is a successful objective, which we can see from the result. The component, the wiring, and the program development are completely done as per previous planning. Although there is a minor issue that happens, such as temperature, the value cannot be displayed on the OLED screen, but the main point of the temperature reading is achieved. The system can still categorise a healthy and unhealthy person based on the value of the temperature reading. Hence, the system can stop a high-risk visitor from blending in with a healthy person.

Lastly, the only unsuccessful objective is to make a comparison between UVC light sanitiser and liquid sanitiser based on their pros and cons. The objective is declared to be unsuccessful because of a failure to get a trusted source as an information reference. Might need more time and more article websites to find the right article that studies this subject. The only sources that talk about this subject are on the internet. It is not counted and cannot be written as a reference because internet sources can be manipulated by everyone. Hence, the information will be doubted as a piece of valid information.

5.0 CONCLUSION

In a nutshell, this project provides many benefits to society. The study helped to answer the question of many and stop doubt in people on how the efficiency of this blue colour lamp in eliminating virus of covid 19. Many don't know there is already plenty of research conducted to produce the right information about the UVC lamp. The implementation is already widened across all ove

In addition, the system also includes a visitor counter with IoT. Users can easily solve program issues with the help of the component functionality checker dashboard. The dashboard is easy to use, user-friendly and can be accessed by any device that has access to the internet. Moreover, this invention can be another alternative for hand sanitisation. People might face a situation where they run out of liquid sanitiser, are allergic to a liquid sanitiser, or just want to have a sanitiser that requires no refill. As long as the building has a power supply, the sanitiser will always be turned on to do the sanitisation process. An idea to change from liquid sanitiser to UVC light sanitiser will always be a good idea.

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