SURFACE DISINFECTING ROBOT
(USING UVC LIGHT)

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INTRODUCTION

The coronavirus disease outbreak triggered a global health epidemic that profoundly affects how we view the environment and live our daily lives; this contagious disease puts our sense of control in jeopardy. The rate of contagion has been tremendously increasing every day. In the face of physical risk, safety measures like physical distancing, proper hand sanitizing and disinfecting private and public facilities must lower the risk of spreading the virus.

For decades, UVC has been used to help minimize the spread germs and viruses. UVC lamps are sometimes called type of radiation of "germicidal" lamps. Ultraviolet light is a that can be used to kill viruses and germs. UV light comes in various forms; they are categorized based on how many resources they have. UVC light or type-c has the most effective way of killing germs and viruses by damaging its molecules. As a result, the germs will be unable to carry out the process required for survival.

Instead of manual disinfection, an autonomous or remote- controlled robot may provide effective disinfection hazardous zones on a regular basis.

Using a robot that can disinfect pretty much anything is a big help to avoid direct exposure to UV light and contaminated areas. On the other hand, it may provide guarantees that won't miss a spot. The procedure is moreMore consistent than human cleaning, and its autonomy enables cleaning workers not to come into contact inside the contaminated area while operating. Moreover, it helps maintain the protection in public and private spaces.

According to the studies of World Health Organization (WHO), no known time frame for how long the COVID-19 virus can live on surfaces for a few hours to several days, depending on the surface type. If a person touches a contaminated surface, the virus can be transferred to the hand. If someone has a viable virus on their hands then touches one of the face's mucous membranes, such as eyelids, nose, or mouth, it will become infected.

Disinfection is an essential tool required before and after opening any facility. In response to the pandemic, malls, restaurants, offices, hospitals, and other public places require proper disinfection. Effective cleaning operations require manual cleaning service: this is a large amount of work, especially in huge spaces. The owner will.

Require a large number of cleaning staff. In terms of disinfecting surfaces, there is a significant risk for people who will disinfect the area. Ultraviolet-c light can kill the virus but direct exposure to this light can damage human skin and eyes, and viruses spread and multiply as people touch infected surfaces in public spaces and workstations, even in our own homes.

Surface Disinfecting Robot (using UVC light) was created to be an efficient solution for disinfecting contaminated areas. Surface Disinfecting Robot can eliminate the large number of people needed. Through the disinfecting, the camera that we

installed on the Robot will be the user's guide on controlling where to move the device; by using a specially designed smartphone application for easy monitoring and control, while the UVC light do its job of killing the virus lingering on the Surface, the Robot will follow the route as per you want to move it. For safety, we use a particular sensor that can detect human presence. The Robot works when no one is present around the area, but the UV lights will automatically turn off if the sensor detects human presence.

OBJECTIVE OF THE STUDY

This study aims to develop and make a Surface disinfecting Robot to contribute to fighting against the spread of the virus in any enclosed areas.

GENERAL OBJECTIVE

This study's general objective is to help disinfect a surface or room without direct contact with humans in a contaminated or infected area.

SPECIFIC OBJECTIVES

1. To provide effective and reliable Surface Disinfecting Robot using UVC, which is responsible for killing the viruses.

2. To develop a Surface Disinfecting Robot that can detect human presence.

3. To develop a Surface Disinfecting Robot that the user can control using a smartphone.

STATEMENT OF THE PROBLEMS

The study specifically seeks to answer the following:

1. What is the characteristic of the device/system in terms of UV Robot, which is currently in use?

2. What improvement can be made out of the current device?

3. What are the similarities and differences of the current and proposed project?

4. What is the assessment of the three groups of respondents namely as; Professors, Students, and Practitioners, in terms of the following criteria? Is there any significant difference?

a. Functionality;

b. Usability;

c. Reliability:

d. Efficiency and

e. Maintainability

5. What claims can be derived from the innovative project?

RESEARCH METHODOLOGY AND SAMPLING

The research uses the descriptive research method is used in gathering the needed information for this study. This method enables the researchers to interpret the theoretical meaning of the findings and hypothesis development for further studies. Specifically, the researchers utilized a questionnaire type of descriptive research method, which enables the researchers to gather information from the respondents without the respondents having any difficulties in answering the questions required for the researchers to gather information regarding the development of the project design of Building Management System. The survey design was used for this study and administered to a selected sample from the 3 clusters, namely: (1) Professors, (2) Students, and (3) Practitioners. The survey involved a questionnaire that sought to obtain data on their opinion and current situation encountered by the faculty members in passing their research output. A survey using questions are easier to use to gather information or DATA needed for the study. The method of sampling used by the researcher is non-probability sampling as the sampling

A technique used in the study. The non-probability sampling uses a non-randomized method to draw the sample. Non-probability sampling technique where the samples are

gathered in a person that does not give all the individuals in the population equal chances of being selected. Most researchers are bounded by time, money, and workforce, and because of these limitations, it is almost impossible to randomly sample the entire population, and it is often necessary to employ another sampling technique.

Evaluation

The project was evaluated on the following criteria namely:

➤ Functionality

➤ Usability

➤ Reliability

- Efficiency

➤ Maintainability

Statistical Treatment

The mean was used as the tool for evaluating the project.

The formula is;

$$x = (Sigma*x)/N$$

Data Gathering Procedures

In developing this project, the following steps were followed:

1. Title proposal, "SURFACE DISINFECTING ROBOT".

2. Gathered data through patent research about the existing and how to make it more efficient.

3. Presentation of the proposed title.

4. Identify what materials were needed in creating the project.

5. Finding the right Ultraviolet light that can kill viruses.

6. Gathering concepts on how to start the project.

7. Starts building the Robot's chassis.

8. Attach all the materials and test the Robot's functionality by controlling it using a smartphone.

SUMMARY OF FINDINGS

This chapter shows the findings resulting from this study.

SOP 1. What is the characteristic of the device/system in terms of UV Robot, which is currently in use?

The Robot uses ultraviolet technology to sanitize areas that have been to minimize the exposure of patients and health workers to any viruses.

It is designed to used and deployed completely autonomously in rooms areas or even whole hospital where infection controls are of paramount.

SOP 2. What improvement can be made out of the current device?

A surface disinfecting Robot is a device that users can easily. Unlike the other device, user can control the Robot using a smartphone and they can also guide the movements of the Robot thru their phone.

SOP 3. What are the similarities and differences of the current and proposed project?

The Surface Disinfecting robot use camera to help the user guide the Robot while controlling the device.

SOP 4. What is the assessment of the three groups of respondents namely; Professors, Students, and Practitioners, in terms of the following criteria? Is there any significant difference?

The following criteria were being assessed by the three group of respondent students, professional and community.

A. ASSESSMENT OF FUNCTIONALITY

Table 7: ILLUSTRATION ON FUNCTIONALITY ASSESSMENT

Indicators	Students		Professional		Community	
	WM	VI	WM	VI	WM	VI
1.1 Functional Completeness. Degree to which the set of function covers all the specified tasks and user objectives.	4.00	HE	4.20	E	4.00	HE
1.2 Functional Correctness. Degree to which the System provides the correctness of results with the needed degree of precision	3.40	HE	4.10	HE	3.90	HE
1.3 Functional appropriateness. Degree to which the functions facilitate te accomplishment of speciad tasks and objectives	3.20	G	4.10	HE	3.80	HE
Overall Weighted Mean	3.35	G	4.13	HE	3.90	HE

Legend:

Excellent (E) 4.20 - 5.00
Highly Extent (HE) 3.40 - 4.19
Good (G) 2.60 - 3.39
Fair (F) 1.80 - 2.59
Poor (P) 1.00 - 1.79

Composite Mean		Rank
WM	VI	
4.10	HE	1
3.90	HE	2
3.80	HE	3
3.90	HE	

As shown in table the group of student, professional and community on their assessment on functionality rated most of the indicators as "Highly Extent" except for functionality of appropriateness which received "Good" rating from the students having an overall weight means of 3.35 for students and 4.13 for professional and 3.90 for the community respectively.

They ranked these indicators as follows: rank 1, "Functionality Completeness. Degree to which the set of function covers all the specified tasks and user objectives." with a composite weighted mean of 4.10: rank 2, "Functionality Correctness. Degree to which the system provides the correctness of result with the needed degree of precision" with a composite weight mean of 3.80; rank 3, "Functionality appropriateness. Degree to which the functions facilitate the accomplishment of specified tasks and objectives." With a composite weighted mean of 3.70.

This result implied that the Surface Disinfecting Robot in terms functionality covered accomplishing user objective with the needed degree of precision.

B. ASSESSMENT ON USABILITY

Table 8: ILLUSTRATION ON USABILITY ASSESSMENT

Indicators	Students		Professional		Community	
	WM	VI	WM	VI	WM	VI
2.1 Operability. Degree to which the system has attributes that make it easy to operate and control.	2.70	G	4.20	E	3.90	HE
2.2 Accessibility. Degree to which the system can be used by people with widest range of characteristics and capabilities to achieve a specified context of use.	3.10	G	4.30	E	4.30	E
Overall Weighted Mean	2.90	G	4.25	E	4.10	HE

Composite Mean		Rank
WM	VI	
3.60	HE	2
3.90	HE	1
3.70	HE	

Legend:

Excellent (E) 4.20 - 5.00
Highly Extent (HE) 3.40 - 4.19
Good (G) 2.60 - 3.39
Fair (F) 1.80 - 2.59
Poor (P) 1.00 - 1.79

On the assessment of usability shown on table, the professional rated the indicators an "Excellent" having overall weighted mean value of 4.25 while community give a "Highly Extent" with 4.10 value of overall weighted mean and students rated the indicators a "Good" with a 2.90 respectively

In summary, they ranked these indicator as follows; rank 1 "Accessibility. Degree to which the system be used by the people whit widest range of characteristic and abilities to achieve a specific context of use." With a WM value of 3.90; and "Operability. Degree to which the system has attributes that make it easy to operate and control." Weighted means 3.60 ranked

2.

This implies that the Surface Disinfecting Robot in terms of usability covers operability, accessibility.

CLAIMS AND CONCLUSION

This chapter presents the claims and conclusions based on the data analysed in the summary of findings.

This study has a main objective of developing a surface disinfecting robot that will be use to many facilities and area to help in fight against viruses.

Claims

1. A Surface Disinfecting Robot comprising;

a wireless connects to any smartphone

a manual controller for user

a motion detector for human presence

a two-charging port

a camera installed.

2. The wireless connection in claim 1, wherein said wireless connection to any type of smartphone.

3. The manual controller for user in claim 2, wherein the users can manually control the said device.

4. The motion detector for human presence, wherein motion sensor is installed in front of the device to detect human presence.

4. The two-charging port as claimed in claim 4, two charging port where

installed in device for the UVC bulb and for the Robot.

6. The camera installed as claimed in claim 5, wherein a camera is installed in front of the Robot for users guide in controlling the device.

Conclusion

Based on the findings of the study, the following conclusions are drawn;

A. According to the evaluation result of the functionality of the device, the degree to which the sets functional completeness, correctness, appropriateness were interpreted as "Highly Extent" by the respondents, which means that the functionality of Surface Disinfecting Robot provide the specific task and user objectives, correctness of the results with the needed degree of precision, and facilitated the accomplishment of specified tasks and objectives.

B. According to the evaluation result of the usability of the system, the degree to which the sets operability and accessibility were interpreted as "Highly Extent" by the respondents, which means that the usability of the Surface Disinfecting Robot had an attribute that make it easy to operate and control and can be used by people with widest range of characteristics and capabilities to achieve a specified context of use.

C. According to the evaluation result of the reliability of the device, the degree to which the sets maturity and availability were interpreted as "Highly Extent" by the correspondents, which means that the reliability of Surface Disinfecting Robot has met the needs for reliability under normal operation and it was operational and was accessible when required for use.

D. According to the evaluation result of the efficiency of the device, the degree to which the sets time behaviour, resource utilization and capacity were interpreted as "Highly Extent" by the respondents, which means that the efficiency of Disinfecting Robot Surface requirements of performing its functions. met the

E. According to the evaluation result of the maintainability of the device, the degree to which the sets modularity reusability and modifiability were interpreted as "Highly Extent" by the respondents which means that the maintainability of the Surface Disinfecting Robot was composed of discrete components such that a change to one component had minimal impact on other components, an asset can be used in more than one system, or in building other assets and can be effectively and efficiently modified without introducing defects or degrading existing system quality.

Recommendations

Based on the foregoing of the study, the following are recommended for the future researcher of Surface Disinfecting Robot:

1. Researchers recommend to use alternate light-weight materials to build the device since the device requires to use a light material so that the device can move faster.

2. Researchers recommend using a durable type of wheels

3. The researcher recommend using other types of human presence sensors for future development of the device.

4. The researcher also recommend for the develop of the device, an application that not only can control and monitor the movement of the device but can also turn it on and off.