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IoT Controlled Disinfection Robot for Safe Health Environment

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ABSTRACT: Disinfection robot aims to limit the spread of transmittable diseases by proper sanitization practises and procedures. Maintaining a clean and safe healthcare environment is the top priority. Infection prevention technologies and recovery, rehabilitation of transmissible disease patients are giving rise to a new era of ultra-clean hospital's and emergency care facilities with the implementation of highly-efficient UV-disinfection robots. The system consists of a robot and a monitoring unit. Monitoring unit sense the room parameters like temperature, Poisonous Gas etc. In the existing system, the robotic navigation is based on line following system. In this project, we propose a Robotic navigation which is based on bluetooth controlled system and the robot have disinfection unit and Sterilization light attached in it. And also provides a notification for the higher authorities through the mobile app with the buzzer sound, once the area is disinfected.

KEYWORDS: Poisonous gas and fire detection, Alert message, Disinfection unit, Mobile App (Blynk).

I. INTRODUCTION

The **COVID-19 pandemic** is an ongoing pandemic. Disinfection techniques is very important during this current pandemic. Healthcare facilities are havens for recovery and rehabilitation. But the healing process would be impossible without the stringent sanitization practices and procedures medical professionals use to prevent health care facilities from becoming reservoirs of unwanted or potentially harmful bacteria and other microorganisms. Maintaining a clean and safe healthcare environment is a top priority, and while significant progress has been made in sanitization methods, major improvements must still be made. According to the CDC (Centers for Disease Control and Prevention), even with modern sanitization protocols, on any given day, about one in 25 hospital patients will acquire at least one healthcare-associated infection. Current manual cleaning methods are nearly helpless in combating against bacteria, but the battle is not lost. Also during treatment of transmissible diseases (which are transmitted to other persons, either by physical contact with the person suffering the disease, or by casual contact with their secretions or objects touched by them or airborne route among other routes) manual cleaning methods are not a good option in isolation wards and ICUs, as it more danger in transmitting the disease to cleaning staffs.

Infection prevention technologies and recovery, rehabilitation of transmissible disease patients are giving rise to a new era of ultra-clean hospital's and emergency care facilities with the implementation of highly-efficient UV-disinfection robots. But the technology is not limited strictly to hospitals and doctors' offices. The UV-Disinfectant robots can also be used to sanitize EMS vehicles and medicopters, as well as in assisted living and extended care facilities. The system consists of a robot and a monitoring unit. Monitoring unit sense the room parameters like temperature, Carbon Monoxide, Poisonous Gas etc. Once the parameters goes high, it will call the robot using IoT based wireless communication through think speak server. The officials/doctors can monitor the current room parameters at IoT cloud server, without going to the room. Robotic system receives the data from server and goes to the isolation wards/labs/ICU. Robotic navigation is based on bluetooth controlled system and the robot have disinfection unit and Sterilization light attached in it. The basic steps of this system are: Poisonous gas Detection, Fire Detection, Disinfection Unit. And also provides a notification for the higher authorities through the mobile app with the buzzer sound, once the area is disinfected.

Paper is organized as follows: In Section 2, we present a brief review of related works on the importance of emerging technologies for Disinfection robots. In Section 3, we describe about methodology In Section 4, We provide

experimental result of working model. The model uses temperature sensors and Gas sensor, also this section including the notification and buzzer sound which we get through the mobile App. Finally, In Section 5, we present the effectiveness or working result of our monitoring robot

II. RELATED WORK

In this section, we briefly introduce related work done based on the disinfection techniques using UV lights. Maintaining a clean and safe healthcare environment is a top priority, and while significant progress has been made in sanitization methods, major improvements must still be made. The main aim of environmental control in the operating room or patient room settings is to keep microorganisms including drug resistant bacteria to an irreducible minimum in order to provide a safe environment for the patient and healthcare worker. Because, infections or bacteria are major problems and significant costs of modern health sector. Cleaning and disinfection are expensive and are not effective enough due to inaccessible areas. Since there is no way to force people to disinfect hands remains to introduce robots to disinfect[1]. At present a type of ultra violet (UV) could aid hospital in ongoing battle to keep microorganisms from lingering in patient rooms and causing new infections[2].

To solve the hospital disinfection problem, several design requirements had to be imposed. There are a myriad of design requirements for a commercial robotic disinfectant. The robot produces UV light in a hospital room and in 5 min it can drastically reduce the germs in room [3]. The device is run when the room is empty after a patient discharge and terminal cleaning. The xenon bulb in the device will pulse for 5 min disinfecting an area around the device. High intensity ultraviolet light is produced by xenon flash lamps across the entire disinfecting spectrum known as UV-C. This UV-C energy passes through the cell walls of bacteria, viruses and bacterial spores. Xenex Full Spectrum UV-C provides four mechanisms of damage against pathogens. Xenex's Pulsed Xenon lamps produce a flash of Full Spectrum germicidal light across the entire disinfecting spectrum (from 200 to 320 nm) delivered in millisecond pulses [4,5]. Advantage of UV light is that it kills germs without the use of chemicals.

III. METHODOLOGY

In this section, we describe the major hardware parts and how our method effectively Disinfected. Then we describe the second part of its working. IOT based monitoring technique is used in this system with DHT11 and MQ-135 sensor. DHT11 sensor is used for fire detection as there is high variation in temperature. MQ135 sensor is used to detect the presence of Poisonous gas. The robot sounds a buzzer and alert to inform the higher authorities, when once the area is disinfected.

- A fully autonomous surveillance robot.
- Fire and Poisonous gas detection
- Buzzer
- Alert message
- Disinfection unit

IV. EXPERIMENTAL RESULTS

Figures show experimental result and hardware, software parts. Description about the components of the Hardware parts and its working.

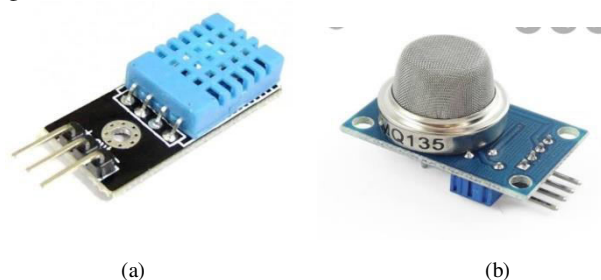


Figure 1 (a) shows that fire detection using DHT11 sensor. 1(b) shows the Poisonous gas detection using MQ-135 sensor

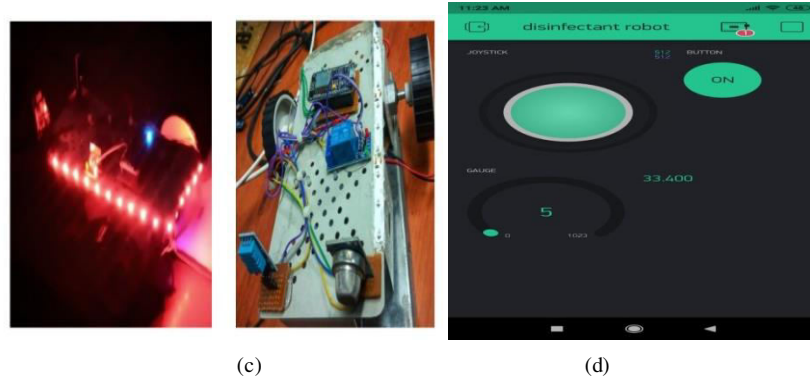


Fig. 2.(c) Working model of Disinfection robot with Sterilization light attached on it. 2(b) shows the software part. Sample image of blynk app which is used to get the notification messages.

V. CONCLUSION

We have presented a IOT based model to control the current pandemic. It helps to limit the spread of transmittable diseases like covid by proper sanitization practises and clean healthcare environments. The system consist of robot and a monitoring unit. Monitoring unit can sense the parameters like temperature, Poisonous Gas, etc.. Highly efficient disinfectirobotscan can give rise to a new era of ultraclean hospitals and healthcare environment. Robotic navigation is bluetooth controlled and it have disinfection unit and Sterilization light attached in it. Once the area is disinfected then the robot makes a buzzer sound and will send a notification message.

We need to perform more studies on the social impact of such robots. . We also need to design better techniques to improve the enforcement of Disinfection practice by using better human-robot interaction methods.

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