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WIFI BASED HOSPITAL SANITIZATION ROBOT

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Abstract

This project describes the evolving role of robotics in healthcare and allied areas with special concerns relating to the management and control of the spread of the novel coronavirus disease 2019 (COVID-19). The prime utilization of such robots is to minimize person-to-person contact and to ensure cleaning, sterilization and support in hospitals and similar facilities such as quarantine. This will result in minimizing the life threat to medical staffs and doctors taking an active role in the management of theCOVID-19 pandemic. The intention of the present research is to highlight the importance of medical robotics in general and then to connect its utilization with the perspective of COVID-19 management so that the hospital management can direct themselves to maximize the use of medical robots for various medical procedures. This is despite the popularity of telemedicine, which is also effective in similar situations. In essence, the recent achievement of the Korean and Chinese health sectors in obtaining active control of the COVID-19 pandemic was not possible without the use of state of the art medical technology.

With the advancement of technology, robots are getting more attention of researchers to make life of mankind comfortable. This report presents the design, development of project Smart Hospital Disinfecting Robot using IORT(Internet Of Robotic Things). The robot operates in autonomous mode as well as in manual mode along with additional features likescheduled time disinfecting and obstacle avoiding. This project will help the healthcare workers in process of cleaning and sanitization making the process autonomous. The main motive behind this project is to help reduce burden on healthcare system which is under pressure due to ongoing covid-19 crisis.

Key Words: Coronavirus, Sensors, Contactless, Design Concept, Navigation Process, Embedded Systems, Wi-Fi Communication, Serial Communication

I INTRODUCTION

Now a days, the whole world is going through a pandemic which is caused by deadly corona virus also known as COVID-19. The first case of covid-19 was detected on 31st dec 2019 in Wuhan, China and WHO declared it as pandemic on 13th mar 2020. This data shows that Covid-19 took less than 3 months to spread throughout the world this tells us the rapid spread of the deadly virus. Due to the rapid and unexpected spread, the healthcare system around world came under tremendous workload causing shortage of staff, overworked doctors, hospitals

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packed with patients, etc. This pandemic also showed us the importance of time to time cleaning of hospitals and disinfecting them. Without proper sanitization, the virus can spread more aggressively. For solving this issue, we are using a IOT controlled robot which will automatically clean the hospital floors and also disinfect floors and environment using Alcohol based solution and a UV light source.This IOT based system will ensure the clean and healthy environment in the hospital without putting any pressure or workload on the already overworked workforce of the hospital. This robot can also used at quarantine centres, airports, railway stations, hotels, government offices and many more public places. This robot will come with a obstacle avoiding mechanism, automatic mode , manual mode and also android controlled using IOT which will ensure that we are using all current technologies while developing the robot. This system will make whole cleaning and sanitizing process automatic and efficient which will help in reducing the spread of disease and making a safe and healthy environment. In the amidst of this global pandemic, stepping in where humans should not, robots are being used for jobs such as sanitizing hospitals and delivering food and medicines, and have proved to be very much useful and handy. Each and every day as health workers, researchers and governments struggle to control the spread of the virus that has infected more than 22,053,135 people globally and claimed more than 777,489 lives [Last updated: August 18, 2020, 07:11 GMT]. robots are also being deployed for administering treatment and providing support to quarantined patients.

The World Health Organization has advised physical distancing for people around the world to prevent community level transmission of Covid-19. Sanitization, which has become a very important aspect in these pandemic times and plays a very crucial role in preventing us from exposure of this deadly virus and thus helping in eradication of this global pandemic is very important. One of the high-risk zones of exposure to this deadly virus is in the area where people rush to for the cure, that are the hospitals and the medical wards.

Sanitization in these areas is indeed challenging and requires very high measures to be taken. But in spite of all these high-end measures taken, there is always a risk associated with it. The objective of this project is minimizing human association as much as possible and thus automating the tasks such as sanitization with the help of robots. In this case, the use of robots can reduce human exposure to pathogens, which has become increasingly important as epidemics escalates. The project uses Autodesk Fusion 360 software for its design and development of the sanitization robot. Arduino integrated development and HC-05 Bluetooth module used for control and programming. The design of the robot has a smile feature that helps in spreading positivity amidst these times.

II MATERIALS AND METHODS Methods

It is an automated house cleansing robot with sanitization feature in it. Taking into consideration the global pandemic Covid-19 situation it is important to keep environment clean and healthy. So, we are trying to develop a robot which will be useful in Hospital, airport, quarantine center and railway station

- Semi Autonomous Mode
- Manual mode

Procedure:

1. When a robot is placed in the middle of the room then it will move forward to the wall and take 90

degree turn and then backward. Now the robot is in the corner.

2. When a robot is placed nearer to the wall of the room then it will move backward to the corner. 3. When the robot is in one of the corners then the working of the robot will start like cleansing and sanitization and in this way the robot will cover all the area of the room

Navigation Part

Arduino Microcontroller: Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 Analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller.

HC – 05 Bluetooth Module: The Bluetooth technology manages the communication channel of the wireless part. The Bluetooth module can receive and transmits the data from a host system with the help of the host controller interface (HCI). It provides a range of up to 10m at a transmit power of 1 m watt. The range can be extended to 100m if the transmit power is increased to 100 m watt.

HC-SR04 Ultrasonic (US) sensor: It is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the transmitter and Receiver

Motor Driver: It is an integrated circuit chip used as a motor controlling device in autonomous robots and embedded circuits. A motor driver is undoubtedly something that makes the motor move as per the given instructions or the inputs (high and low). It listens to the low voltage from the controller/processor and control an actual motor which needs high input voltage.

DC Motor: DC motors are used for the movement of the robot where it is connected with the motor driver, whenever the trigger signal is given to the motor driver then the motor moves according the trigger with the given speed.

Servo Motor: A servo motor is a rotary actuator or a motor that allows for a precise control in terms of the angular position, acceleration, and velocity. In order to control the turning of the robot, servo is used in the design.

Sanitization Part

DC Pump Motor: DC powered pumps use direct current from motor, battery, or solar power to move fluid in a variety of ways. Motorized pumps typically operate on 6, 12, 24, or 32 volts of DC power. Solar-powered DC pumps use photovoltaic (PV) panels with solar cells that produce direct current when exposed to sunlight.

Relays: Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. Here, Relay is used to switch the UV lights with separate power.

UV Light: UV light connected to separate power supply via relay and switched on by electronic trigger

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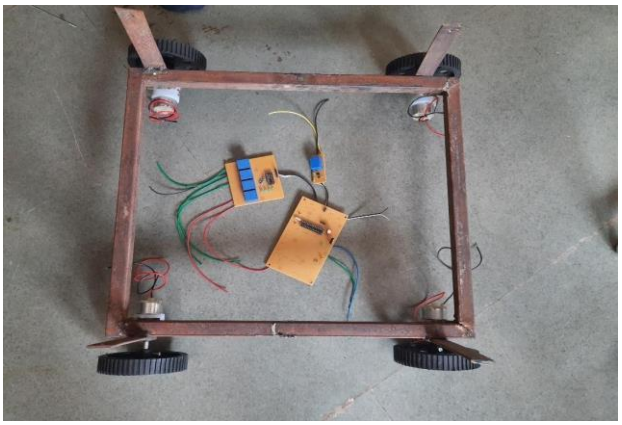
generated from Arduino. Here UVC lights are being used as itis effective for the destroying pathogens and other bacterial, virus present in air and moisture. From relays UVC lights are connected and when trigger from Arduino is given, switch is closed in relay and UVC lights are ON.

3. FIGURES AND TABLES

Frame used in project



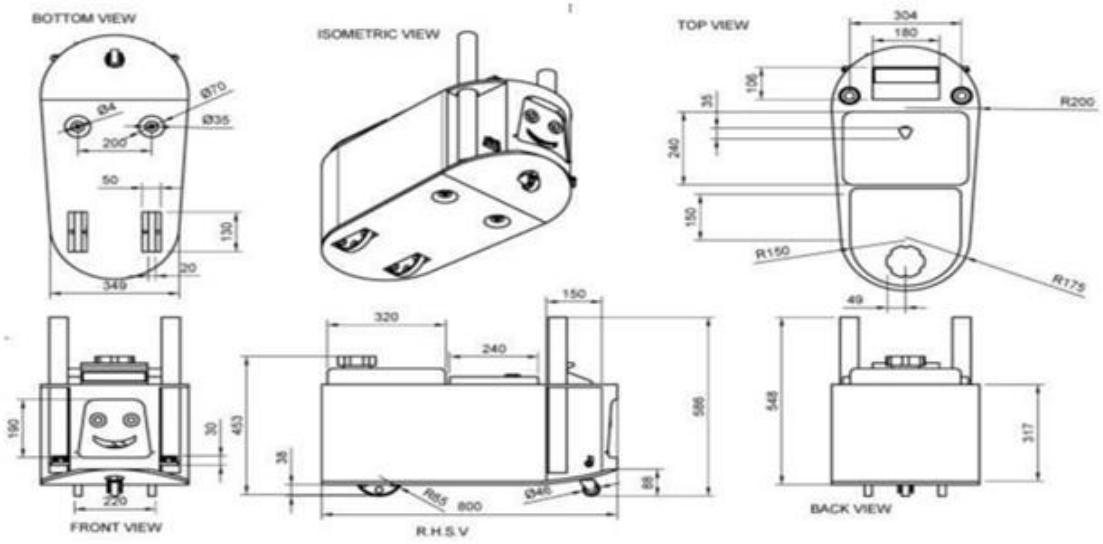


Fig. Mechanical drawing

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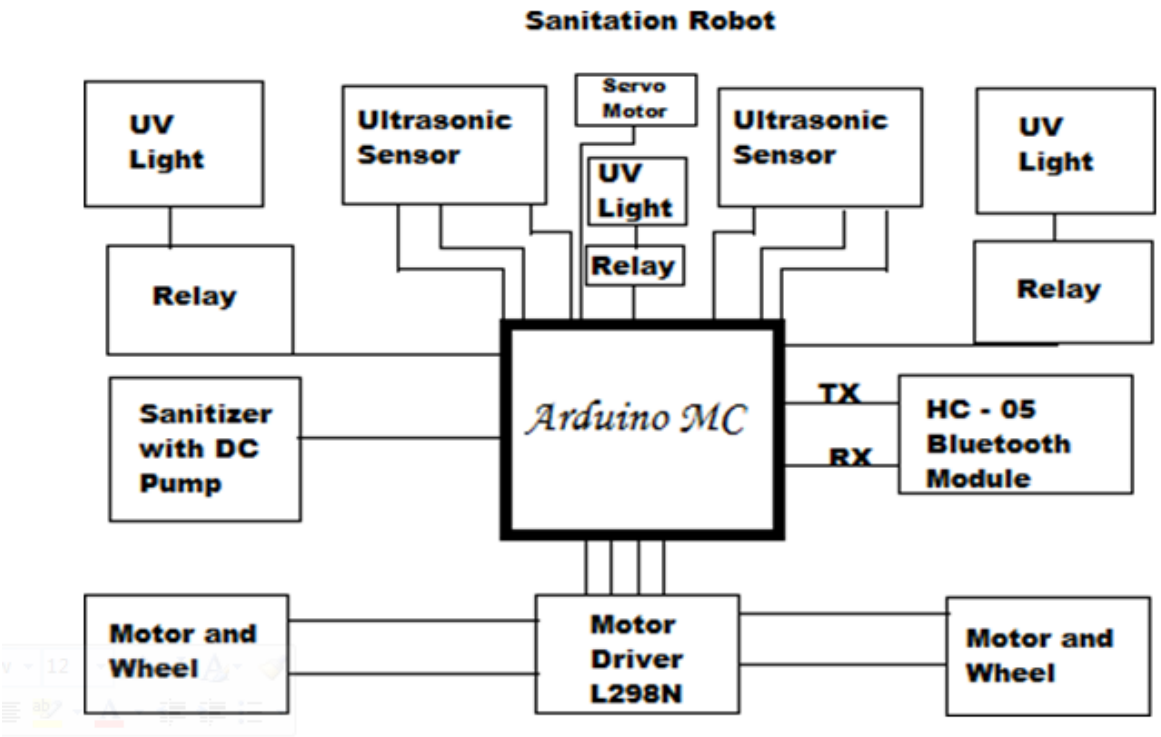

Fig. Block diagram

IV CONCLUSION

The current COVID-19 pandemic boosts innovation on many public, societal and medical levels and disinfection practices are not an exception. Disinfection robots are a promising tool for surface decontamination in the hospital already today, but with even greater potential tomorrow. Further design adjustments of hospitals and devices are needed to overcome the issue of shadowing and free the movement of robots in the hospital environment. One-size does not ft all, and apart from communication between robot and the environment, more work must also be invested in defining efficient wavelength and exposure time to allow sufficient energy to be applied on each surface, as a function of the intended pathogen to be inactivated. Finally, a ft-for-purpose hospital environment would allow disinfection robots to function independently. Presently, disinfection robots do not replace routine (manual) cleaning but may complement it. They might in the future provide validated, reproducible and documented disinfection processes. Further technical developments and clinical trialsin a variety of hospitals are warranted to overcome the current limitations and to find ways to integratethis novel technology in to the hospitals of to-day and the future.

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