IoT Based System For UV-Sanitizing

Mr. R.V.Viswanathan[1], Mrs.V.Sivasakthi[2], Mr.R.Ramarajesh[3]
[1, 2, 3] Assistant Professor, Dept of Information Technology
[1, 2, 3] Anjalai Ammal-Mahalingam Engineering College, Thiruvarur

Abstract- *IoT(Internet of things) describes the network of physical objects "Things" that are embedded with sensor software and other technologies for the purpose of connecting and communicating overthe internet. The design depicted here, shows the preventive measures that can be taken during the covid-19 pandemic in the world. Human lives change extensively and the only way to minimize the spread of the virus is to maintain social distancing and to the follow guidelines proposed by our respective government. Sanitization and sterilization have become an inevitable part of our daily life. By talking about sanitization and sterilization, there is a problem, we can't directly involve in the sterilization process, because there is a chance of getting the deadly virus from the contaminated space. So we introduce the smart, most efficient and powerful device for sanitizing the contaminated places. The main objective of the paper is considering the precautions to be done for future human life. Here we create a powerful, autonomous device which can sanitize the place without exposing ourselves. The Advantage of autonomous device is low cost, rechargeable, low power consumption and kills 99.9% of viruses and bacteria in surface. Another notable benefit is to reduce the contact between medical staff and the virus, thus ensuring the safety of them.*

Keywords- Ultrasonic sensors, UV LEDs, Sanitization, sterilization, Obstacle detection.

I. INTRODUCTION

Nowadays, a critical issue faced on sanitizing and cleaning done by humans in this pandemic. One of the high-risk zones of this deadly virus is in the area where people rush to for the cure thatis the hospitals and the medical wards. Sanitization in these areas is more challenging and requires very high measures to be taken.

Here we using Arduino pro mini which size is 1/6 of Arduinouno and runs at 3.3 volts. Also using HC-SR04 Ultrasonic sensor for detect the obstacles. UV-C rays are harmful for human body so we have used a laser diode to represent the UV-C LEDs. It will kill the RNA of the virus. The objectives of our project is to use the device in all public places like hospitals, schools, colleges, malls, restaurants etc.

II. LITERATURE SURVEY

a. Programmable and low-cost ultraviolet room disinfection device

This paper mainly focused on creating a room disinfection device based on Ultraviolet-C radiation and device controlled by app via bluetooth. It offers the capacity to be remotely programmed and it has an infrared detection security system that turns off the system when triggered. The control unit is based on the Arduino UNO, this gives the order to the switch to turn on the uv-c lamps using an electromechanical relay and An HC06 bluetooth module is used to communicate with the board using Bluetooth devices, there are three LEDs were installed to indicate its functional state. Green LED indicates the connection of the electrical supply, Blue LED indicates bluetooth connection establishment and red LED indicates activation of UV-C lamps. Here UV-C radiation is harmful to humans, So PIR sensor was added as a security measure. The device is automatically turned off when a user is near. This system is easily scalable to generate higher ultraviolet dosages adding more UV-C lamps. It is easily customizable. This device represents an open source, secure, fast .The device is configured in less than three minutes and it does not require continuous monitoring.

b. Arduino based dry & wet automatic floor cleaner.

This paper describes the development of automatic floor cleaner. This paper construct a floor cleaner which will be fully automatic providing dry and wet cleaning as well as UV sterilization. This device contains IR sensor and ultrasonic sensor play a major role for detection of objects and distance and the Arduino gives signals to the motors to take turn according to the position. It provides wet cleaning via the combination of water sprinkler and roller. Finally, it also kills the germs of the floor via UV lamp present at the tail end of the machine. They were using Arduino for its cost reduction and simplicity. It facilitates to keep their place clean and hygienic.

c. Automatic floor cleaner

The project is mainly used for domestic and industrial purpose to clean the surface automatically. When it is turned ON, it sucks the dust by moving all around the surface as it passes over it. It contains vaccum cleaner for collect the dirt as it passes over the surface. Dc motor for changing direction of wheels and two sensors are incorporated with device for detecting the hurdles or obstacles and detect the height in order to prevent the device from falling down. If enough current produced then Dc motors can be operated directly otherwise motor driver is required so as to provide high current up to 0.7b to 1.2 ampere. This cleaner can spin anywhere in any direction. They are using UART communication protocol for communicate with the device via program. The assembly level program has been programmed in to the microcontroller. The controller is used to drive the motors. Reducing the human effort just by starting the cleaning unit.
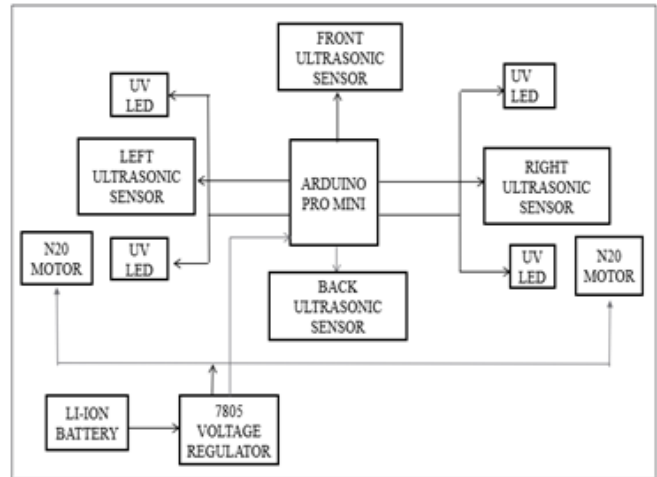
d.Floor Cleaning Robot with Mobile-App or Autonomous

This paper focused on the development of an autonomous mobile robot and a Manual Phone Application Control prototype can able to cleaning a room or even an entire house is not a peddling. An autonomous vacuum cleaner robot able to randomly navigate through a room or a house with the minimum human involvement. The concept of the robotic vacuum is based on retrieving data from an array of inputs that will tell the condition of the floor space around the vacuum and these inputs include sonar, touch sensors, and digital compass. The data from these inputs will be fed into the chip through its software program will decide which direction the vacuum should move by sending the control signals out to the drive motors. Vacuum Cleaner Robot is used to make cleaning process become easier rather than by using manual vacuum.

III. PROPOSED SYSTEM

We have design an IOT based device which is fully autonomous. It is capable of sanitize the floor to kill the RNA of the virus. Virus like COVID-19 can remain active on surface for a long time and UV light has been proven to destroy the RNA in viruses, which reduces the chance of transmission. The major outcome of the autonomous device is to support the people who are worked in the hospital for cleaning purposes.

IV. SYSTEM ARCHITECTURE

Figure 1 – BLOCK DIAGRAM

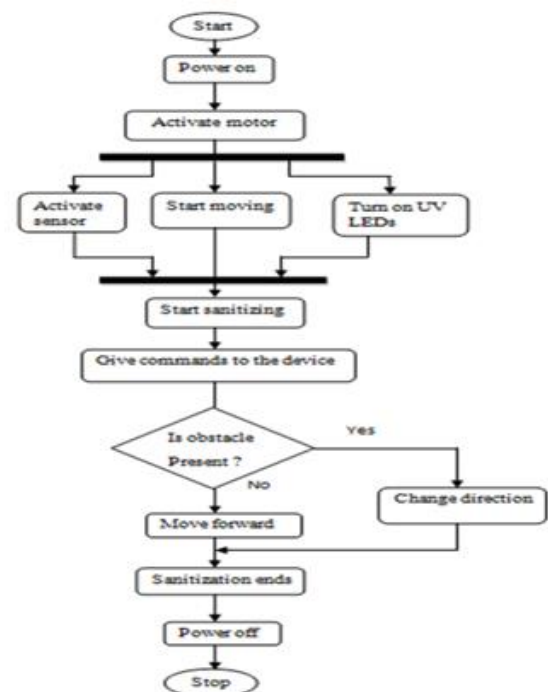### V. PROJECT IMPLEMENTATION

Figure 2 – Flowchart

The implementation of the proposed model is shown in figure 2. After activating the motors, Sensors will detect the obstacles while moving from right side to left side and so on. The UV LEDs will emit UV rays which kill viruses present in the surface.

a.Arduino pro mini

This is a microcontroller board developed by Arduino.cc and it is based on ATMega328.There are two version of Arduino pro mini available , i.e 5V and 3.3V which run at 16MHz and 32 MHz respectively. Arduino board plays vital role on embedded system and other electronic products .In Arduino Pro Mini the USB circuitry are removed to make it more compactable. Connect all the components with wires to the corresponding pins of Arduino pro mini. after the basic connections, Need to upload the obstacle detection program and device activation code to the Arduino pro mini using ArduinoIDE platform via usbttl board and run the module for each sensors. Then output is displayed in the serial monitor. After checking the working of these modules, then all components will be connected according to the system architecture.

After the device is turned ON by the user, power is supplied to the battery which is rechargeable lithium ion 7.4V battery. This is converted into 5V using 7805 voltage regulator. It will trigger the motor driver for activating the motor to move the device. The UV LEDs starts sanitizing by the command embedded in an Arduino. If the sensors detect the obstacle in front of the device while cleaning a surface, it will change the direction immediately. Main aim of this implementation is to sanitize Harmful virus and sterilize the flat surface.

b. HC-SR04 Ultrasonic module

It is a four pin module, which are named as Vcc, Trigger, Echo and Ground pin. HC-SR04 ultrasonic sensor is aAdaptable device that has become a staple in robotics projects. It is less expensive and it measures the distance between itself and the nearest object.It calculates the time travelled by the sound and velocity of the sound. It has reasonable accuracy and can be even more accurate with one additional component. This sensor has two eyes which is Ultrasonic transmitter and Receiver.

c. UV-LEDs

Ultraviolet LEDs are responsible for killing the virus. Bio-organisms such as bacteria, viruses are deactivated when exposed to UV light.

d. Motor driver

Motor driver is used to connect the motor with microcontroller and provide sufficient voltage supply. Thevoltage change its direction to rotate the motor in clockwise or anticlockwise direction.

VI. MODULES AND DESCRIPTION

a. Obstacle Detection

We have chosen ULTRASONIC SENSOR MODULE it will detect obstacles and avoid those before a collision happen. The ultrasonic sensor uses a technique called "ECHO". "ECHO" is simply a reflected sound wave. . In this device, we have four ultrasonic sensors. When an obstacle comes in front of any sensor the device will turn in to the opposite side and avoid that obstacle. For example if an obstacle comes in front of the left sensor device moves to the right.

Formula for calculating distance from obstacle = duration*0.034/2;

b. UV sterilization

When the device is powered ON, the UV LEDs will ON and the sterilization process will continue. It has four UVC LEDs with the minimum range of 100 to 280 nm, so it is 100% safe to operate. UV sterilization is a method of killing bacteria, mold, fungi, and viruses without the use of harmful chemicals. UV disinfection and sterilization systems are proven to be: Highly effective, Cost-efficient, and chemical free.

VII. CONCLUSIONS

This paper is described to sanitize the flat surface in all public places like hospitals; schools etc., UV LEDs can kill 90 % harmful viruses. This device is easy to handle and it is fully autonomous. In future need to develop the ROBOT to sanitize all types of surfaces.

REFERENCES

[1] ShubhamTiwari, Prof. SangeetaKotecha, GauravRasal, PramodShukla, AjinkyaMandavkar "Arduino based cleaner robot" International Journal of Engineering Research & Technology (IJERT) 2017.
[2] Anabel Rivera, Antonio Rivera, Eros Garcia "UV Disinfecting Robot for Tabletops" Final Report for ECE 445.
[3] YudaIrawan, Muhardi, RianOrdila, RoniDiandra "Automatic Floor Cleaning Robot Using Arduino and Ultrasonic Sensor" Journal of Robotics and Controls (JRC)| July 2018.
[4] S Monika, K.ArunManjusha, S V S Prasad, B.Naresh"Design and Implementation of Smart Floor Cleaning Robot using Android App" International Journal

of Innovative Technology and Exploring Engineering (IJITEE) March 2019.

[5] Sara E.Beck "UV LED Disinfection 101"Article released on 11 September 2018.

[6] Rohankadam, Kavishjain, KiranLokare, KrushankantShinde, MadhuraPedneker "Smart parcel box with UV based Sanitization" Journal of International Research Journal of Engineering and Technology (IRJET)| June 2020.

[7] K. Rajesh, M. Gopikrishna, V.R. Rao, P. Pavani, C. Chandrasekhara"Smart applications using Robotic and Iot Technologies in Fighting against Pandemic Covid19 in Medical and Societal Sectors"International Journal of Innovative Technology and Exploring Engineering (IJITEE)| May 2020.