

TEMPERATURE MONITORING AND WIRELESS SANITIZATION BOT USING ARDUINO AND ANDROID

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Abstract - The aim of the proposed system is to contribute in the fight against the spread of Covid-19, a novel human coronavirus, in hospitals, public transport, airlines, and any enclosed areas. The proposed system can be adopted the physical disinfection method by using UVL light as an agent. The UVL devices are studied and classified according their disinfectant units, complementary devices, combined disinfection agents, mobilities, and order types. This system shows that a mobile robot is the most efficient device to inactivate microorganisms and developed a robot called Robot UVL. The robot is equipped with six UVL lamps tow in front and back one on each side. The fixed Temperature Monitoring system is used to detect the infected person in the environment. The robot can estimate automatically the disinfection time while monitored by Bluetooth connection from a phone or a tablet.

Key Words: Coronavirus, Sensors, Contactless, UVC Lamps, Navigation Process

1. INTRODUCTION

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. Robots are also being deployed for administering treatment and providing support to quarantined patients. [1,2]. 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 Ultraviolet Sanitization and Temperature monitoring Robot is a Bluetooth controlled bot equipped with a UV light system. The system contains a moving robot

vehicle and a ground station controller (GCS). The operator can control the robot using the Android application (EASY SCAN, BLUETOOTH RC CONTROLLER) of the ground station controller (GCS). The robot can disinfect and kill diseases, viruses, bacteria, and other types of harmful organic microorganisms in the environment, with ultraviolet light, by breaking down their DNA-structure. [3,4] Currently, several countries have tested these robots successfully to disinfect their hospitals, public transports, office spaces, and other public places. We have implemented this UV robot in a cost-effective way to expand the disinfection process to public places. Temperature monitoring device help us to save the data of scanned list in digital form.

2. System Implementation

The Fig -1 shows a block diagram of the proposed system. **Arduino Microcontroller:** **Arduino Uno** is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 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. A Bluetooth module is a short-range device of around 10 meters which provides both sound and data transmission.

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.

MLX90614: It is a **Contactless Infrared (IR) Digital Temperature Sensor** that can be used to measure the temperature of a particular object ranging from -70°C to 382.2°C . The sensor uses IR rays to measure the temperature of the object without any physical contact and communicates to the microcontroller using the I2C protocol. The main component of this Non-Contact Thermometer is a MLX90614 Non-contact temperature sensor. The working of MLX90614 is described in next paragraph. The output from this sensor is connected to Arduino Nano. Arduino print the temperature on smart phone with the help of Serial Monitor Android App. So no need of external power pack. Because Arduino and sensor will take power from smart phone.

TCRT5000: It is an IR sensor unit. It has both a Photodiode and a Phototransistor coupled in its package. This sensor can be used to detect the presence of object or any other reflective surface in front it, also with some level of programming it can also calculate the distance of the object in front it.

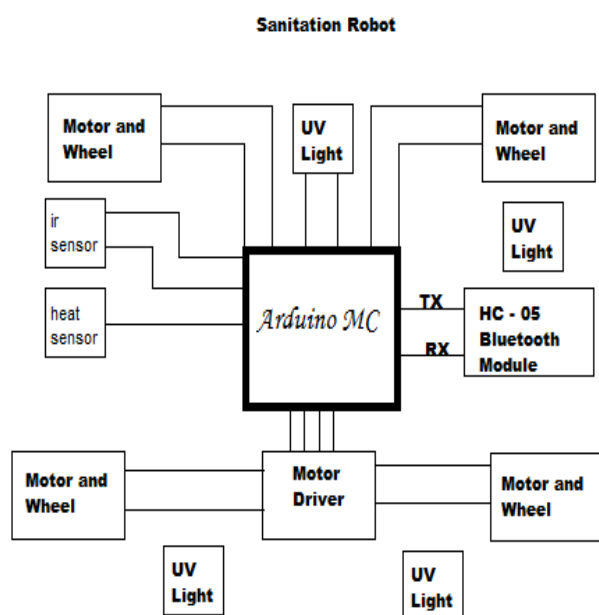


Fig -1: Block diagram of the proposed system

According to the proposed system, the Logic Commands are processed by phone. Command is then sent to the receiver side via Bluetooth. Command received via Bluetooth is forwarded to Arduino Uno board using UART serial communication protocol. Arduino code checks the commands received. Whenever the command is a matching string, Arduino controls the movements of the robot accordingly in forward, backward, Turning Right, Turning Left & Stop. Signal logic levels at the different stages of the circuits for proper controlling of the robotic car are forward is F, back is B, left is L, right is R, front light on is W, front light off is w. Ultraviolet light is a disinfection method that uses short-wavelength ultraviolet (ultraviolet C or UVC) light to kill or inactivate microorganisms by destroying

nucleic acids and disrupting their DNA, leaving them unable to perform vital cellular functions. UVC is absorbed by RNA and DNA bases and can cause the photochemical fusion of two adjacent pyrimidines into covalently linked dimers, which then become non-pairing bases. UV is used in a variety of applications, such as food, air, and water purification. UV can be used to prevent the spread of certain infectious diseases. Low-pressure mercury (Hg) discharge lamps and LEDs are commonly used in UV applications and emit shortwave ultraviolet-C (100–280 nanometer) radiation, primarily at 254 nm.

Fig-2, shows the temperature monitoring system. Temperature monitoring work with the help of MLX sensor which read the object temperature with the Measurement resolution of 0.02°C . It is an IR Temperature sensor for non-contact temperature measurements. It has an I2C Interface to communicate with microcontroller.[5,6]. Here the Arduino Nano as microcontroller. This temperature sensor can measure the temperature without touch the object. It has 0.5 degree Celsius over a wide range of temperature. TCRT is used to detect the object at a certain level here it is set to less than 200 range which is coded. When it meets the range criteria less than 200 it will trigger the MLX6014 to read the object temperature. The reader values shown in the android application (EASY SCAN). All the scanned records and be viewed on the application with time and date and can also be shared in excel format for maintaining records. If the temperature meets the threshold level the app recommended to take the photo of the object.

Remote Operating System Commonly wheel-based robots face some difficulties when traveling in complex environments such as steps and obstacles area. To avoid this problem, vision systems and remote-based wheel operating systems are used in mobile robots. The working principle of the automatic sanitizer robot is similar to a Television remote. When pressing the button in the remote, it obeys the input signal through the app. Initially, the input data reaches the Bluetooth module, and then the signal goes to the Arduino module. The Arduino program passes the commands to the motor drive and the motor turn on.

FORWARD-F Forward function F button allows robot to move forward when user gives F command in terminal mode.

BACKWARD-B Backward function B button allows robot to move backward when user gives B command in terminal mode

LEFT-L Leftward is the function used in Loop block it allows robot to move left side when user gives L command in terminal mode.

RIGHT -R Rightward is the function used in Loop block it allows robot to move right side when user gives L command in terminal mode.

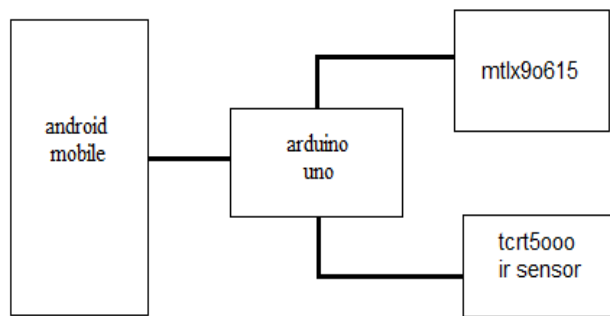


Fig -2: Temperature Monitoring system

3. CONCLUSIONS

The Arduino Based Wireless Temperature Monitoring and Sanitization Robot make the sanitization process and temperature monitoring easier to compare of spraying disinfectant liquids which are 70% alcohol-based liquids. It leads to have more material and huge man power to disinfectant and need to spend money on it.

In the proposed model, the temperature values would be in digitized form, hence the values can be recorded easily and very accurately.

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