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Automatic Sanitization Robot

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***Abstract* - This project describes the evolving role of robotics in healthcare and allied are as 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 the COVID-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.To overcome the problem developed automatic portable sanitizing equipment for spraying sanitization solution. The portable sanitizer unit is attached to the top of the mobile robot. The system integrates a sprinkler mechanism and is used to distribute air and disinfectant fluid mixture. The mobile robot main components consist of a DC motor, Bluetooth module, Arduino, Motor driver, Submergible pump, Sprinkler, Battery, DC Converters are used. The system is capable of sanitizing the floors of hospitals.**

Keywords: Covid-19; Hypochlorite; DC motor; Bluetooth; Arduino.

I. INTRODUCTION

This project describes the evolving role of robotics in healthcare and allied areas with special concerns relating to sanitizing a room or area to avoid 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. Our robot will sense the obstacle and will take turn Will keep on spraying liquid every 3 seconds and will disinfect or sanitize the given area Robot can be controlled through Bluetooth module.

A few research papers related to medical robots have been reviewed and the following references show influence on the design of the smart medical assistant robot. Marcin Zukowski et al [1] have developed a humanoid medical assistant and companion robot dedicated to children hospitals. They have focused on the robot being able to express emotions and communicate with the children by recognizing their faces and using pictures and text on the chest display to tell stories and present educational videos. The 'Bobot' autonomously navigates through hospital rooms and performs simple medical tests like measuring patient's body temperature or heart rate and sends live video feed to the doctors and nurses. The robot is run using ODROID XU and XU4 with Ubuntu 14.04 operating system and has a dedicated Raspberry Pi 2 computer to animate the robot's eyes.

Marcin Zukowski et al [2] presented the implementation of patients' temperature measurement system for the medical robotic assistant. They have experimented with MLX90614 infrared thermometer and FLIR Lepton thermal camera and found out that the MLX90614 infrared thermometer cannot be used as the only input source of the system and to get more accurate results, robot would need to come as close as less than 0.3 metres to a patient's face. To overcome this they created a hybrid system having infrared thermometer.

1.1 Objective

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.

1.2 Materials & Methods

The robot is capable of effectively killing microorganisms on the floor, such as fungi, bacteria, and viruses, and has significant effects on harmful microorganisms [6]. The robot cans automatically patrol for sterilization and disinfection in a predetermined area. The sprinkler is equipped with a double-acting pneumatic cylinder, and the purpose of the cylinder is used to pushes the air into the tank [7]. The main components consist of a sprinkler robot, is DC motor, Bluetooth module, Arduino, Motor driver, Submergible pump, Sprinkler, Battery,

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DC Converters. The frame is made up of a 3mm Galvanized iron sheet with a dimension of 440 mm length and 240 mm width. The frame acts as a base and is used to assemble all the components.

II. BLOCK DIAGRAM & DESCRIPTION

In a given Figure: 1 Show's a Block diagram of Robot. There are total two sections.

Input Section

- Arduino NANO
- Bluetooth Module
- Ultrasonic Sensor

Output Section

- DC pump & Motors
- Relays Buzzer

2.1 Block Diagram

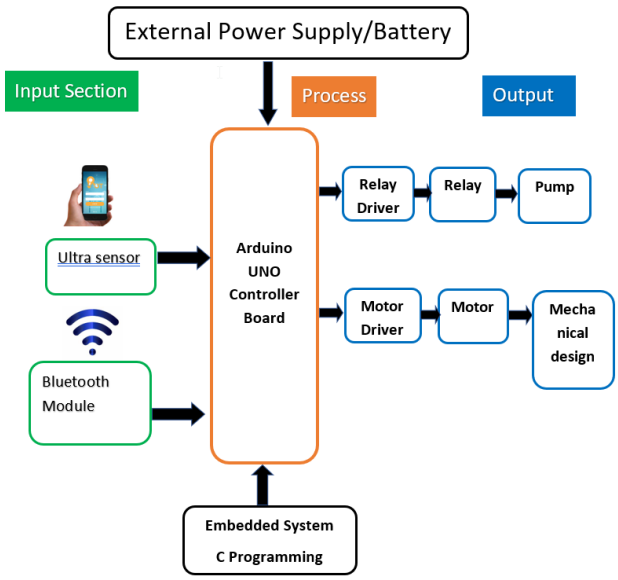

Figure 1: Block Diagram of Robot

2.2 Input Section

Arduino NANO

- The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P.
- It offers the same connectivity and specs of the UNO board in a smaller form factor.
- The Arduino Nano is programmed using the Arduino Software (IDE), our Integrated Development Environment common to all our boards and running both online and offline.

Bluetooth Module HC-05

- HC-05 is a Bluetooth module which is designed for wireless communication. This module can be used in a master or slave configuration.
- Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.

Ultrasonic Sensor

- An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.
- It used to detect object in front of the Robot.

2.3 Output Section

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 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.

Buzzer

- An Arduino buzzer is also called a piezo buzzer. It is basically a tiny speaker that you can connect directly to an Arduino. You can make it sound a tone at a frequency you set. The buzzer produces sound based on reverse of the piezoelectric effect.
- Buzzer is use in 5-12 v dc Supply. Whenever a object sense by the Ultrasonic sensor a buzzer will be turn on.

III. RESULTS AND DISCUSSIONS

Design Calculations

(i) Sprinkler flow rate
Theoretical
$Q=k\sqrt{p}$
p=20 psi
k=5.6

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Q=5.6 √20
Q= 25 GPM
Q=Flow Rate (GPM), P=Operating PSI of head/Outlet
K=K Factor of Head/outlet

(ii) Analysis For 1 litre, the flow rate of the Sprinkler is 476seconds.
For the project the flow rate of the sprinkler is 200 seconds.
The area of the sanitizer covered is 600mm. The acquired Flow rate is 17GPM

(iii) Motor Specifications
Speed = 200 RPM,
Voltage = 12V,
Power = 100W
Torque of the motor Torque = (P X 60) / (2 x 3.14 x N)
Torque = (100 X 60) / (2 x 3.14 x 100)
Torque = 9.554 Nm,
Torque =9.554 x 103 Nmm

(iv) Battery life calculation Robot working hours for one full charge.
Batter capacity = 12v 7Ah (Ampere Hours)
Total device consumption = 520ma (mill ampere)
Battery Life = Battery Capacity in mAh / Load Current in mA
= 7000mAh/520ma = 13.46 Hours.

IV. CONCLUSION

We as a group had begun working for more than a year ago and now we come to the completion of our project. It has been a very fulfilling experience for all of us. We have got a thorough learning experience and we shall cherish it for long. Despite being challenging and different from other assignments, it is a path where we have learnt a lot about hardware, software, troubleshooting and other aspects of engineering. It was a chance given to us that we go deep into applying what we had learnt in earlier years of our studies and we grabbed it with both hands.

For simplicity we divided the project work into smaller parts and alternately took leads in performing those parts following the principle of the best man for the job. Since we were new to this, at initial stages most of our decisions were not apt for the required situations. At such times our professors and other knowledgeable friends came to our help. From finding the project idea to publishing this report, learning has been a continuous process. There have been times where we have taken inappropriate decisions but have then learnt how to overcome them and not to commit those errors in future tasks.

The project has helped us study the practical use of microcontroller programming and its application. We have learnt about robots and pump etc that what are the various stages one needs to follow when pursuing a project and how efforts as a team can be put towards finding solution to problems arising in the process. This opportunity given to us had proved very beneficial as it provided us with an avenue to furthermore dig into analoge and digital electronics.

REFERENCES

While making this project, we referred to several books, technical magazines, websites and visited some technical exhibitions. We have listed these references below.

Books:

[1] Kenneth Ayala, The 8051 Microcontroller, Cengage Learning, New Delhi, 2005.
[2] Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, The 8051 Microcontroller And Embedded Systems, Perntice-Hall of India, New Delhi, 2007.

Papers:

[3] Bharadwaj, Alok & Yadav, Divyanshu & Varshney, Shreyshi. (2015). NON-BIODEGRADABLE WASTE – ITS IMPACT & SAFE DISPOSAL. International Journal of Advanced Technology in Engineering and Science. 3. 184- 191.
[4] Himadri Nath Saha, Sourav Gon, Annesha Nayak, Samabrita kundu, Sumandrita Moitra , "IoT Based Garbage Monitoring and Clearance Alert System" 2018 IEEE 9th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON) Pages: 204 – 208.
[5] Mahmoud Tarokh and Malrey Lee, " Kinematics Modeling of Multi-legged Robots Walking on Rough Terrain" 2008 Second International Conference on Future Generation Communication and Networking Symposia.

Technical magazines:

[6] Electronics For You

Websites:

[7] www.circuitstoday.com
[8] www.howstuffworks.com
[9] www.societyofrobots.com

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