Original Article

Automatic Multimode Floor Disinfecting Robot for Covid-19 Prevention

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Abstract: *In this work, we design a fully automated sanitizing robot to assure a covid free zone in complex urban atmospheres. To accomplish this, we develop the robotic system with Arduino based embedded controller. For automation and control, Bluetooth based wireless communication enabled. The proposed robotic system automatically handles the obstacles in the path with sensor arrangements. Further, the entire area of target places is covered by path planning algorithm. Implementation results show that this sanitizing robot can be automatically working with acceptable human response by conducting trials in many urban circumstances.*

Keywords: *Covid- 19, Sanity, Automated Sanitizing Robot, Artificial intelligence, Sterilization.*

I. INTRODUCTION

COVID-19 epidemic has speedily converted the most affected and trouble making occurrence practiced by society all over the world. Society may want to survey with the covid-19 for a lengthy period. COVID-19 has affected a public worldwide; it also spoils the economic aspects among the people. Virtually, social distancing is the only way to reduce or control the spreading rate of COVID-19. To maintain a social distancing, various arrangements have been established like monitoring cameras etc.

The sanitization techniques utilized for different practical rooms in clinics incorporate manual showering of disinfectants, ultraviolet (UV) light illumination, and programmed sterilization robots [1-3]. The danger of manual sanitization is that people might be presented to possibly defiled surfaces, causing nervousness, strain, and loss of usefulness for clinical staff, particularly in clinic virus units. Moreover, public frenzy about COVID-19 has prompted the advocacy of sanitization robots [4-6]. Robot sterilization ordinarily can be partitioned into two classifications: UV light illumination and compound sanitization. Most glass and plastics can decrease the force of UV radiation; along these lines, unstable compound sanitizers perform better in fixed conditions contrarily, Robotics filed have grown up and used in various applications like medical, housekeeping, hotels and industries.

The present COVID-19 epidemic situation has brought innovative application and prospects for robots, like swab testing robots, cleaning robots; social distance monitoring robots' drones and medical robots for managing against COVID-19.The objective of proposed robotic system is to propose a automatic sanitizing system to prevent a covid spreading. the proposed system is fully automated which includes sensors for path following and obstacle detection. The proposed robot cost wise inexpensive and can carry sanitizers for long period.

II. RELATED WORKS

Chen, Z et al designed robot using quadruped platform integrated with multiple cameras and sensors. The proposed robot uses on board system to maintain social distancing in the environment. The robotic systems are programmed with crowd-aware navigation protocol for improved accuracy in detection. For communication, LiDAR based wireless transmission has been used. Wang et al presented a low-cost miniaturized robot for covid monitoring. The proposed robot built with wireless temperature monitoring system for covid spread control. It consists of swab gripper for position control. The entire system controlled with low-cost Arduino controller.

Alsamhi, S. H et al introduced a block chain protocol integrated robot for fighting COVID-19 and future epidemics. The proposed robot includes ultra-sonic sensor, IR sensor and temperature sensor for environment monitoring. The collected data transmitted to other end by using block chain protocol. The security of data transmission is assured in proposed protocol. The data from patients also maintained confidentially in a proposed system Hussain, K et al proposed a

machine learning based robot system for covid environment control. The machine learning algorithm of artificial intelligence used for automation, arm control and movement control. The accuracy of robot movement and working is improved by neural network training.Hu; Y et al introduced a 9-degree-offreedom (DOF) based robot for covid swab sampling. The concept of image processing is used for controlling the arm movements. The samples are collected in secure way without any contact to the persons. Deep learning algorithm used for image segmentation and classification in order to identify the position of the person. By varying the impedance value, the position of arm can be controlled. the proposed model verified successfully in human phantom model.

Kajol Mohanty et al developed deep learning based robotic system for monitoring health parameters of the patients. The health monitoring sensors of pulse rate, temperature and oxygen level sensors are used for continuous patient monitoring. The collected data's from patient updated in server using IOT technology.

Leng, Y et al designed a Wheel-Legged Robotic Limb (WRL) for sanitizing the public places. the proposed robot can carry the weight upto 1.77kg to cover the all places for sanitizing. The movement and walking of robot is controlled by closed loop system. to cover the all regions, the path planning algorithm is used in embedded controller.

Snyder, S. E et al proposed mask wearing status monitoring system for covid prevention. The concept of machine learning based face recognition system is used for mask wearing status identification. The proposed system identify the people effective when they are not wearing the mask .For accurate detection, the thousands of masks wearing people faces trained in a recognition system.

Zhao, Y.-L et al proposed a chlorine dioxide (ClO_2) sterilization robot for floor cleaning. The proposed system is designed with fully automatic functions with path control. it covers all regions for sanitization with minimum routing path. The proposed system is integrated with IOT technology for automatic updating.

Amrita Rai et al designed a mask cleaning system for covid epidemics. It uses UV light to clean the surgical mask automatically without any human intervention. The cost of the system is very low with miniaturized circuits.Akshet Patel et al proposed a medi-robot for combined patient monitoring and surveillance. The machine learning algorithm of support vector machine (SVM) has been used for classification and detection. the distance between peoples is controlled by voice alerts which is already programmed in controller. The medicines to the patients delivered automatically based on timing.

Wei Chen et al presented design of robotic arm for covid swab sampling collection. The proposed model fabricated with raspberry pi controller with compact size. the motions of arm controlled by placing IR sensors. It supports for ominidirectional bending also. Andrea Giusti et al developed a robot with zigbee wireless control. The path and task planning are controlled through the zigbee communication. The proposed automated model detects obstacle using both sensors and image processing techniques. Experimental results prove the efficiency of proposed model in the presence of obstacles

III. PROPOSED SYSTEM

Considering the risk of COVID-19 due to manual sanitizing and irregular spraying, it is essential to develop asanitizing robot to do spray in all places through Bluetooth access. Robot-assisted cleaning is a hopeful solution because it eliminates the burden of human being, is suitable for wide area, is inexpensive, and provides level adjustments. The proposed robot system primarily comprises controller, wheel alignment system, and Bluetooth device for communication as shown in Fig.
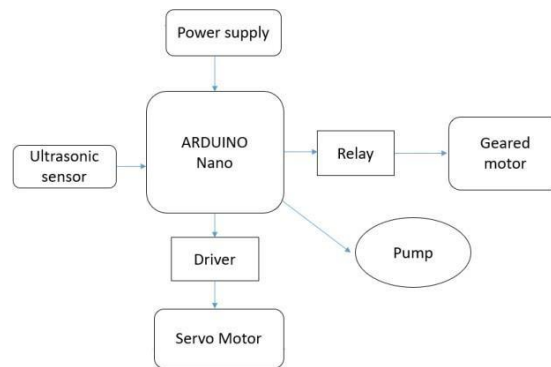

Figure 1: Proposed Robotic System

A. Arduino

Arduino is an open-source computer hardware used for building digital devices. Compared to other controllers, arduino has in build analog to digital converter and PWM controller. It has 28 bin with 8 bin for analog to digital supports. It has been programmed by using embedded c language.

Figure 2: Arduino

a) Arduino Servo Motor-SM

The concept of the servo engine depends on PWM. It implies that the term of pulses applied to the particular control pin controls the point of revolution of the motor input. The development of the SM is like a DC engine. It implies that it has a rotor, stator, and control congregations. It has shut circle criticism for controlling the force and speed.

b) Bluetooth Module HC-05

HC-05 utilizes serial communication to communicate with the other devices. Generally, it is used to pair small components like mobile phones using a wireless communication to transfer a data. It can operate at the 2.45GHz frequency band. It can cover up to 10m without any contact.

Figure 3: HC-05

IV. IMPLEMENTATION RESULTS

The proposed system implemented using Arduino controller with IR sensors and Bluetooth devices as shown in figure. The IR sensor used for obstacle avoidance and Bluetooth for manual controlling of robot.

V. CONCLUSION

Robotic based systems are considered as a promising solution for fighting against infectious diseases. Chemical sanitization with robots wants to monitor or control multiple parameters, including the level of sanitizing and place for spraying, time and path for movement. The proposed robotic model can satisfy all the needs to avoid covid spreading. It covers all the place with any human intervention. Also, it can be worked in both manual and automated mode. Other chances based on future development is includes machine learning or artificial intelligence for effective control and monitoring.

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