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Social Distancing and Monitoring Robot for Queue Management

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Abstract: ***Since the COVID-19 pandemic took the world by storm, governments around the world have taken tough but necessary measures to control its spread. During the COVID-19 pandemic, social distancing was widely used as a non-pharmaceutical prevention measure. So we designed social distancing monitoring robot that aims to limit the spread of Covid by measuring the distance between individuals in queues. This system is very essential for banks, government offices, shopping malls, schools, and theatres, among others, where long queues can last for hours every day. Furthermore, this robot also consists automatic hand sanitization and contactless temperature measurement. The design and working of social distancing Robot, Contactless Human Body Temperature and Sanitization is presented in this study.***
Keywords: COVID-19, Pandemic, Social Distancing, MLX90614 Sensor, hand sanitization.

I. INTRODUCTION

According to the World Health Organization (WHO), viral and infectious diseases continue to emerge and pose a serious threat to public health and well-being. Coronavirus is a virus family that causes illnesses ranging from the common cold and flu to severe respiratory issues. COVID-19 is much more dangerous and easily spread than other Coronavirus families because it has become extremely efficient in human-to-human transmissions. Furthermore, this pandemic has caused significant economic and social impacts.

Many governments around the world have implemented different practices that promotes social distancing. Travel restrictions, a ban on large events and gatherings of many people, a request for citizens to stay at home as much as possible, and keeping distances of 1.5–2 meters from each other are among the measures. People may need to live with the virus for a long time. Nonetheless, people must go outside for essential work, healthcare, and food, and such measures are not always easy to implement. As a result, it is critical to develop technologies that facilitate social distancing.

Globally, social distancing is being used to prevent the spread of COVID-19. However, social separation alone will not protect you from the virus; it must be combined with hand sanitization and temperature monitoring. In this COVID-19 pandemic scenario, we have understood the temperature monitoring. Sanitization refers to the cleaning or sterilization of an object or body part, such as the hands or the entire body. Due to the pandemic of COVID-19, temperature measurement of persons became one of the major tasks is to detect the affected one.

From a technical point of view, people have begun to deploy robots to deal with the current challenges brought on by COVID-19, such as preventing the extremely infectious virus from spreading further, improving efficiency within specific industries, and continuing necessary social functions.

The goal of our project is to create a social distancing and monitoring robot system, specifically for queues. Furthermore, this robot will protect individuals by performing tasks such as automatic hand sanitization and contactless temperature monitoring. We expect that this project will help to maintain social distancing and monitoring in queues. Furthermore, this robot also perform task such as automatic hand sanitization and contactless temperature measurement. The rest of the paper is laid as follows. The literature on social distancing, automatic hand sanitization, and temperature measurement is discussed in section 2. Section 3 discusses problem statement. The methodology and working are included in section 4 and 5. Section 6 and 7 contains the Result and conclusion.

II. LITERATURE SURVEY

In [1] At the beginning of December 2019, a novel coronavirus (CoV) known as '2019-nCoV' or '2019 novel coronavirus' or 'COVID-19' began in Wuhan City, Hubei Province, China. COVID-19 is transmitted by dust particles and fomites when the infector and the affected person are in close proximity. The most serious danger posed by coronavirus is its rapid spread. That's why authorities can't fully monitor local outbreaks. Therefore, governments have introduced measures like quarantines around the world. covid Symptoms usually begin with nonspecific syndromes, such as fever, dry cough, and weariness.

In [2] According to authors People who are at a higher risk of overexposure to covid19 should maintain a greater social distance. So, it is critical to keep a minimum of six feet away from others. To determine the distance between people and control the spread of viral infections they had developed tail tracking and social distancing robot they have used an arduino as a microcontroller, then using an arduino uno, connect the buzzer and ultrasonic sensors to the arduino's available out ports. Here, the ultrasonic sensing feature is main principle in this protocol. The Ultrasonic transmitter sends out an ultrasonic wave, which travels through the air and is reflected back toward the sensor when it encounters any material. The Ultrasonic receiver module detects this reflected wave.
In [3], The authors believe that in order to protect oneself from the coronavirus, one should clean one's hands on a regular basis and keep track of one's body temperature. The contactless temperature sensor (mlx90614) will be activated first, followed by a contactless hand sanitizer. In this proposed method, they have proposed automatic sanitization and contactless temperature measurement, in which these two systems communicate with each other at the same time. In this case, the Arduino is linked to an ultrasonic sensor, which detects objects within its range. When the ultrasonic sensor detects a hand, the spray pump activates, spraying sanitizer onto the palm via a small pipe. As a result, the proposed method provides individual protection.

III.PROBLEM STATEMENT

It is essential to control the spread of the corona virus in order to reduce the negative effects of the virus on global health and the economy. Social distancing is a viable non-pharmaceutical strategy for limiting the spread of a virus with increased transmissibility. Also Right now, sanitation and temperature measurement are the most important commodities. As a result, we intended to develop a approach that could maintain and monitor social distance while also providing automatic hand sanitization and contactless temperature measurement. So, when these measures are applied, the effects will be greater, and the total number of cases at the end of the pandemic will be lower.

IV.METHODOLOGY

The robot consists mainly three parts: social distance monitoring, automatic hand sanitization and contactless temperature measurement. We have used Arduino Uno as a microcontroller. Because the Arduino Uno has a convenient and user-friendly time interfacing with analog sensors, motor, etc. The robot will move along with queue by using line following method. Initially robot will check the path using IR sensor and if there is no obstacle then it will follow the path along with the queue.
When the first person comes in contact with the robot, temperature is measured with the help of MLX90614 temperature sensor. The MLX90614 is a contactless temperature sensor which can measure temperature without even touching the object. And if temperature is greater than the set value then buzzer will get turn on. After that automatic hand sanitization will be done using an ultrasonic sensor and water pump. We have used ultrasonic sensor module both for sanitization and for social distancing. Because ultrasonic sensor measure distance by using ultrasonic waves. To measure the proper distance between two individuals we have set the value to six steps. So, if any two individuals found having less than six steps distance between them, then the robot will sound an alarm through buzzer and alert the authorities.

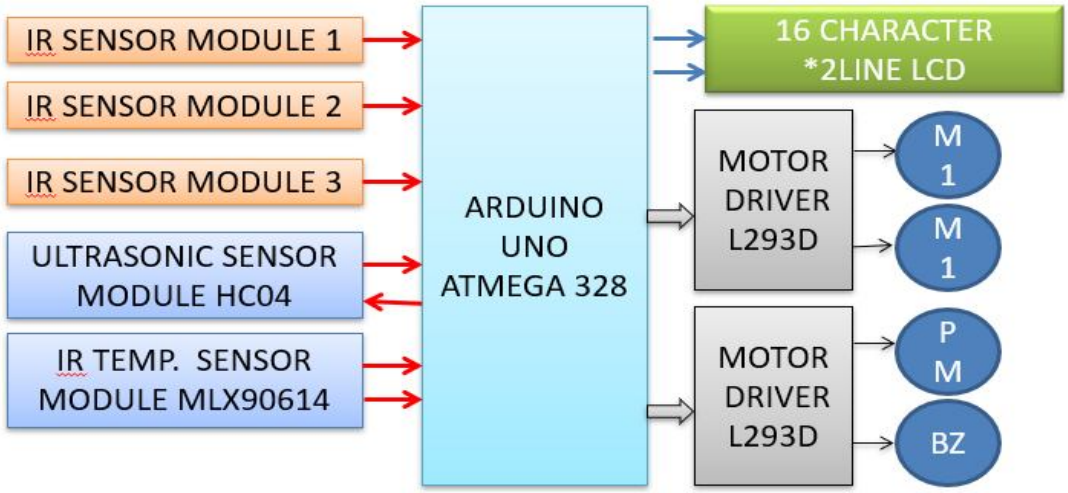

Fig.1 Block Diagram

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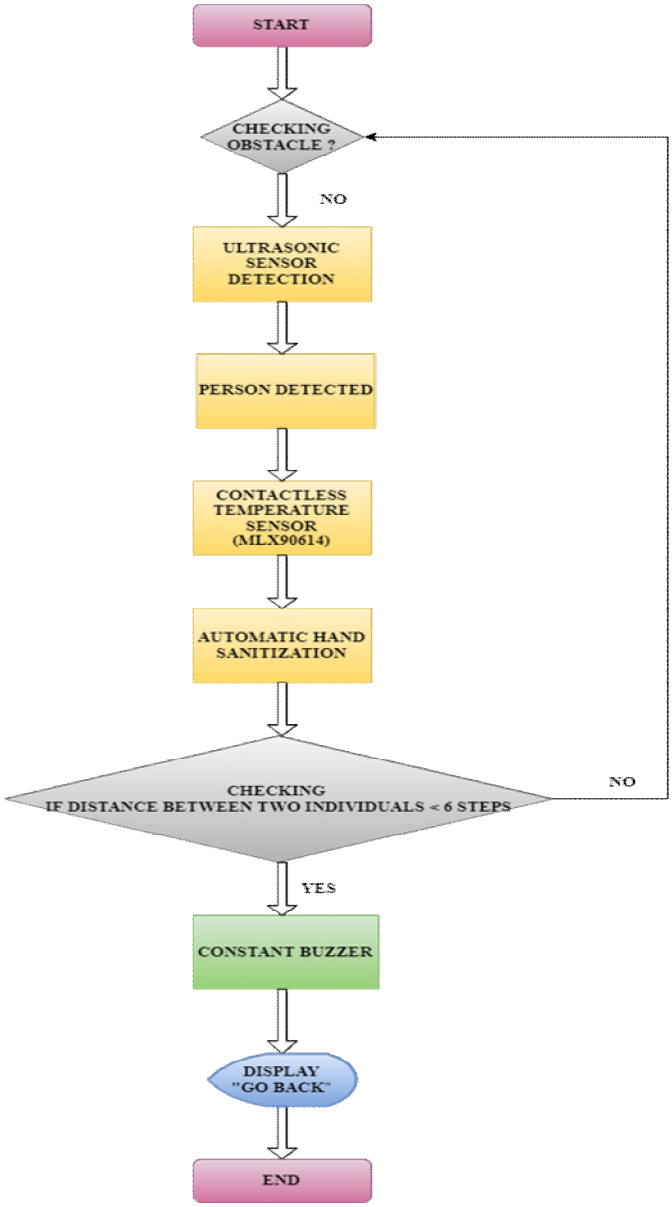

Fig.2 Flow Chart

V. WORKING

The robot is based on line following principle. We have used two IR sensor module to travel along with queue in order to detect social distancing violations. It also uses another IR sensor module in order to detect obstacles in path. In this proposed method we are using Arduino Uno as a microcontroller. The ultrasonic sensor module is connected to the Arduino Uno. We have set the range of ultrasonic sensor (Hc-sr04). As a result, whenever the person comes within range of the ultrasonic sensor, it will be detected. Following that, it will use the MLX90614 contactless temperature sensor to measure the person's temperature, and if the measured temperature is higher than the normal temperature, it will sound an alarm via buzzer. If the person's temperature is within normal range, the next step is sanitization. When the ultrasonic sensor detects a hand, it activates the spray pump, which sprays sanitizer onto the forehand via a small duct.

In this proposed method, initially step counter is in reset mode. So, when the first person come within the range of ultrasonic sensor then the controller will keep it in memory. Then we have set the counter value of 6 steps. When counter starts counting steps, if the next Person comes in the range of Ultrasonic sensor before 6 steps, then buzzer will get turn on and it indicates that the second person is not a safe distance away from the first. So, the robot will turn on the buzzer until the person is within safe distance. And this process will continue along with the queue.

VI. RESULT

Figures show result and hardware implementation of social distancing monitoring robot. The robot simulation has completed, and the results are found to be within range. The simulation of the robot using arduino and sensor is shown in Fig. whenever two individuals are found having less than 6 steps then the robot will sound buzzer. The system is less complicated and the robot is ideal for keeping social distance and monitoring people in queues.

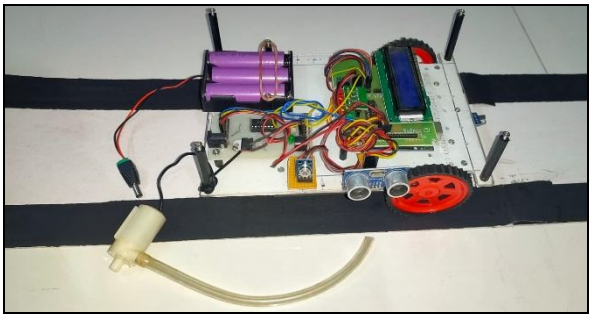

Fig.3 Social Distancing and Monitoring Robot

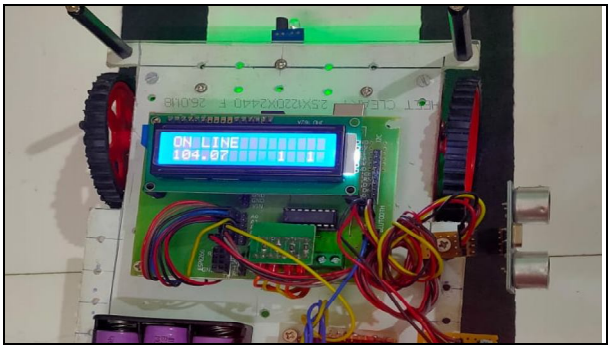

Fig.4 Path is checked and Person is detected

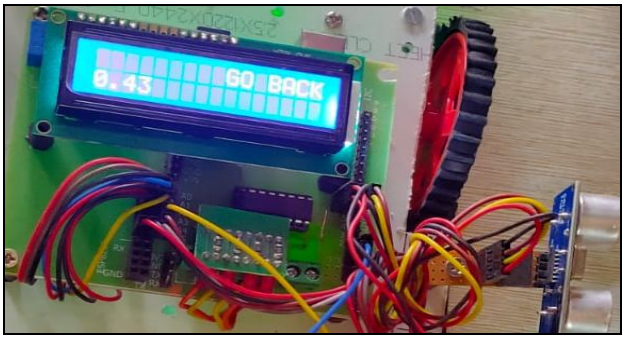

Fig.5 If the distance between two individuals <6 steps it will sound buzzer and LCD will Display “Go Back”.

Fig.6 Contactless Temperature measurement is done by MLX90614 sensor.

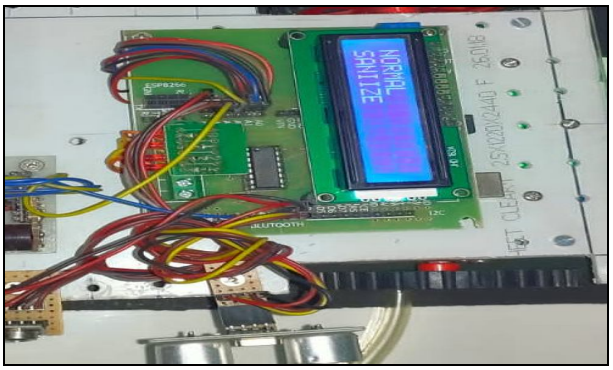

Fig.7 Automatic Hand Sanitization is done by using Ultrasonic sensor

VII. CONCLUSION

Shielding like social distancing is recommended to prevent the spread of Covid-19. To prevent the current pandemic, we've presented a social distancing and monitoring robot. It contributes in limiting Covid's transmission by monitoring the distance between disease-spreading individuals. This robot is specifically designed with the purpose of maintaining distance between individuals in queues. If two people are found to be within 6 steps of each other in queues, the robot immediately sounds a buzzer to alert about the violations. Also, Sanitation and temperature measurement were also used as preventive measures around the world during the COVID-19 epidemic. Therefore, this robot also includes a contactless temperature measurement and automatic hand sanitizer.

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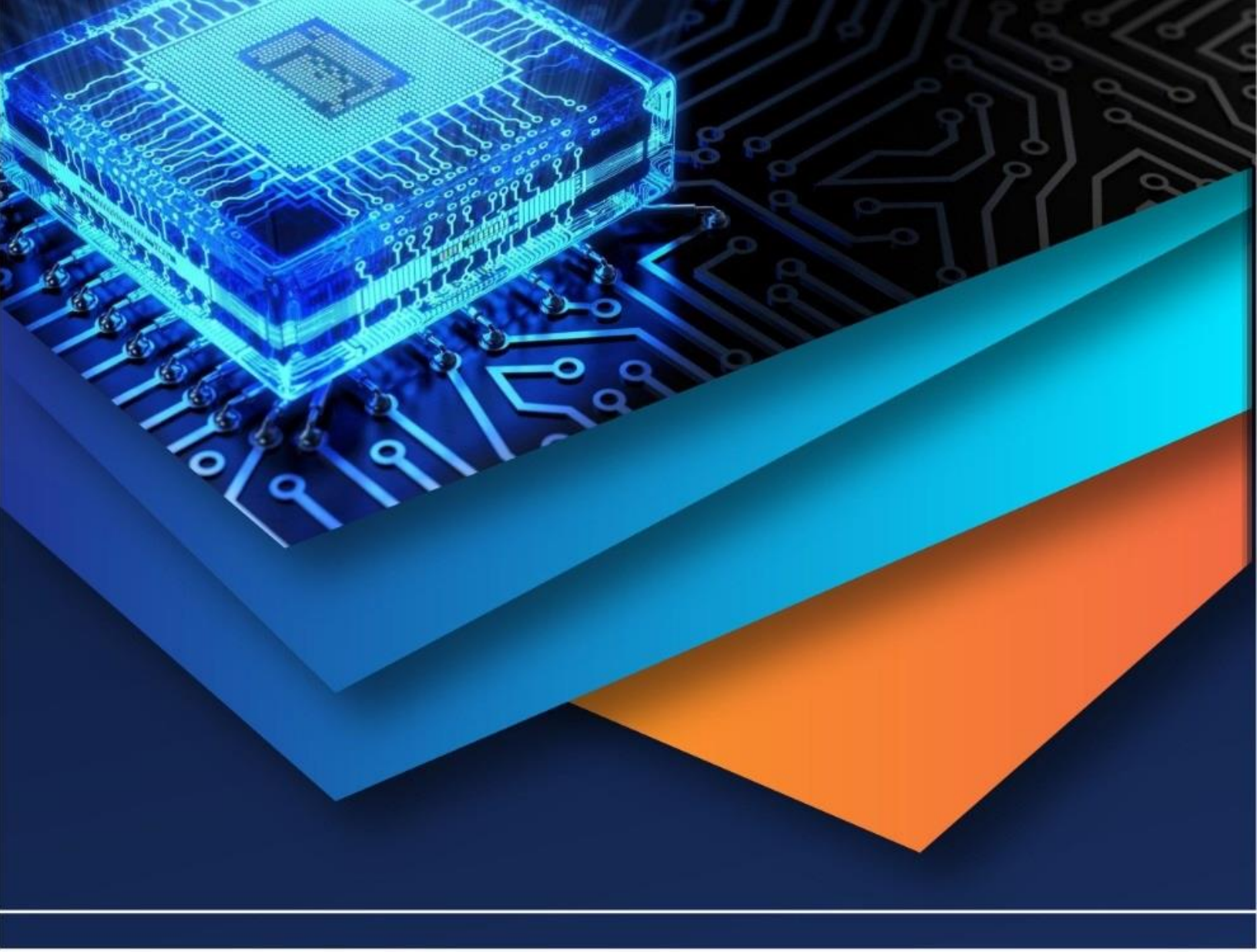

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