RESEARCH ARTICLE OPEN ACCESS

IoT SOCIAL DISTANCING & MONITORING ROBOT FOR QUEUE

Aditi Vijay [1], Ashutosh Gupta [2], Ashwani Pal [3], B. Sriswathi [4], Geetika Mathur [5], Satish Kumar Alaria [6]

[1],[2],[3],[4],[5] Student, Department of Computer Science & Engineering, AIET, Jaipur
[6] Assistant Professor, Department of Computer Science& Engineering, AIET, Jaipur - Rajasthan

ABSTRACT

During the current pandemic, social distancing is crucial because it helps limit the development of Covid due to the perceived distance between people who spread the disease. Currently, there is no option to place one person in each row 24/7 to monitor social distancing violations. Banks, authorities, shopping centers, schools, theatres, etc. There are often long queues for several hours a day. To verify the queuing social distance, we want to develop a social distance robot.

I. INTRODUCTION

Since the end of 2019, the COVID19 pandemic has spread globally and may become a major health and safety issue for communities, health workers, and health systems around the world [1]. During the pandemic, there are plans to use robots around the world to improve patient care and reduce the burden on the medical system. People may have to coexist with the virus for a long time. In fact, one of the most important effective measures to control the Maintaining social distancing performs a important function in stopping the unfold of infectious diseases. Diseases much like COVID19. spread of the coronavirus is to maintain social distancing. By minimizing close physical contact between people, we reduce the chance of contracting the virus and spreading it throughout the community. Observing the norms of social distancing between people has become an important measure to prevent the spread of COVID19 [2].

Our goal is to introduce a unique method for mechanically observing a pair of people, in a crowded environment that does not comply with social distancing restrictions. Relative to the distance of two meters between them [3]. In order to test the social distance of the queue, we developed a robot with mandatory social distance. The robot consists of a four-wheel frame system used to drive the robotic vehicle. It uses the tail tracking principle to continuously queue and track behaviors that violate social distance [4]. The infrared sensor moves the stern left and right to monitor violations. Currently, the robot is equipped with ultrasonic obstacle detection sensors to detect obstacles in the vehicle path. The robotic vehicle uses another ultrasonic sensor to determine the distance between two people. The distance between people is less than two meters, and the robot immediately beeps and warns of injuries [5]. In addition, it also sends these violation notices and camera images via WiFi via the Internet of Things to notify and notify superior departments/key workplaces. If there are signs of violations, they will be subject to disciplinary action immediately [6-7].

II. HARDWARE COMPONENTS REQUIRED

Ultrasonic Sensors: An ultrasonic sensor is a virtual device that measures the gap to a goal via way of means of emitting ultrasonic waves and changing the pondered sound into electric signals. Ultrasound travels quicker than audible sounds (that is, sounds that may be heard via way of means of humans). Ultrasonic sensors have simple components: transmitter (to ship sound via the piezoelectric crystal) and receiver (to come across sound after it enters and leaves an object). Figure 1 shows the ultrasonics sensor.

Figure 1 Ultrasonic Sensor

DC Motor: When a current-sporting conductor is located in a magnetic area, it transmits torque and has

an inclination to move, that is, whilst the magnetic area and the electrical area interact, mechanical pressure is generated. According to this principle. This is known as a motion action. It is as depicted in figure 2. A DC motor is any form of rotating motor that converts DC electric power into mechanical power [8,9].

Figure 2 DC Motor

Buzzer: A buzzer may be a valid sign instrument, which is probably mechanical, mechanical tool or piezoelectric. Typical makes use of for buzzers are alarms, timers, and affirmation of person input, collectively with mouse clicks or keystrokes. Figure 3 shows the buzzer.

Figure 3 Buzzer

IC: An integrated circuit (IC) is an electronic device that contains various diodes, transistors, resistors, and/or capacitors made from wafers or crystals of semiconductor materials. Integrated circuits are commonly used in robots and their control.

Figure 4 Integrated Circuit

Transistors: One of the foremost basic functions of an electronic transistor is to act as associate electronic switch. It is as shown in figure 5. We want the transistor to allow a small amount of current to flow from the collector to the emitter when it is "off," and to let as much current as possible through it. May be "on".

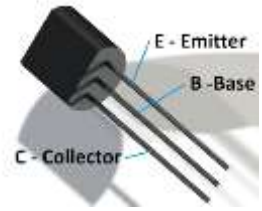

Figure 5 Transistor

Resistors: The foremost feature of resistors in a circuit is to manipulate the float of modern-day to different components. Figure 6 shows the resistor. Take an LED (light) for example. If an excessive amount of modern-day flows thru an LED it's far destroyed. So a resistor is used to restrict the modern-day.

Figure 6 Resistor

Capacitor: It is an electronic component whose function is to store electrical charges and then release them. A capacitor is a component that stores charge or energy when a voltage is applied as depicted in figure 7. Compared with batteries that generate new electrons through chemical reactions, capacitors behave exactly like electrons. Repositories, don't create them.

Figure 7 Capacitor

Diode: A diode is a tool that lets in current to waft in a single path however now no longer the other. This is accomplished with the aid of using the integrated electric powered field. Diodes are two-terminal gadgets that behavior power withinside an identical path. Figure 8 shows the diodes.

Figure 8 Diode

LED's: A crystal rectifier is an electronic component that emits light when current flows through it. It is a semiconductor-based light source as shown in figure 9. When current flows through the LED, electrons and holes recombine and then emit light.

Figure 9 Light Emitting Diode

PCB's: The circuit board connects electronic components through etched copper through holes and gives the robot circuit mechanical strength. Printed circuit boards are made of multiple layers of inorganic and organic dielectric materials. Figure 10 shows the PCB.

Figure 10 Printed Circuit Board

Wires and Connectors: Figure 10 shows the wires image**.** There are two main purposes for connecting robots: the first is to provide power to the robot's equipment, and the second is to provide a communication network for the many devices that make up the robot control system.

Figure 11 Jumper Wires

III. SOFTWARE SPECIFICATION

Raspberry Pi: The Raspberry Pi board is a small computer (approximately the scale of a credit score card) that may without difficulty hook up with the Internet and engage with many hardware components. Raspberry Pi is more and more utilized in robotics projects. Figure 12 shows the structure of Raspberry Pi [10,11].

Reasons to use Raspberry Pi:

Raspberry Pi is small and cheap

Raspberry Pi is powerful

Compatible with large communities

Multiple I/O

Multiple connected devices: monitors, cameras, etc.

Easy to use

Figure 12 Raspberry Pi

IV. CONCEPT OF LINE FOLLOWING ROBOT

The successor of this production line is an intelligent robot. Find the black line on the floor and trace it. The path is predefined, it can be a white line and black line, or the opposite (white line and black line). He can sing in the street through infrared sensors. The sensor has an infrared transmitter and an infrared receiver [12]. The infrared transmitter (infrared LED) emits moderate radiation, and the receiver (photodiode) emits moderate radiation. The time is seen from the ground. Although not all surfaces currently reflect moderate IR radiation, the best part is that a white background can completely reflect them, and black background can completely see them, as shown in the image below. Figure 13 & 14 shows the surface of black & white [13,14].

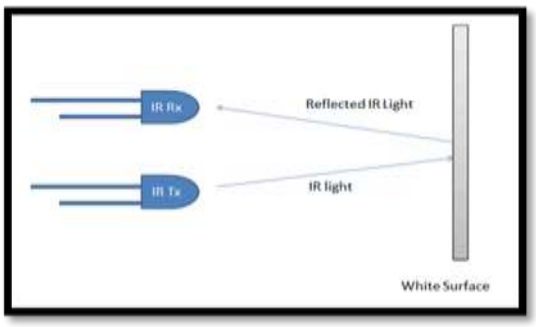

Figure 13 White Surface

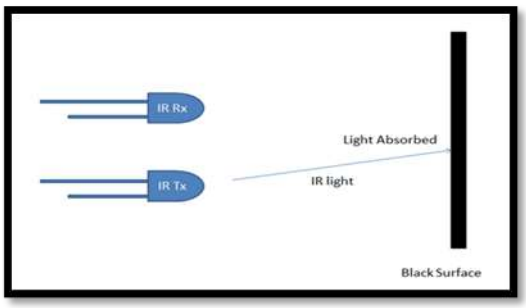

Figure 14 Black Surface

V. WORKING PRINCIPLE OF LINE FOLLOWIING ROBOT

In this line tracking robot, we use two infrared sensor modules, a left sensor and a right sensor. When the left and right sensors detect the target, the robot will move forward Figure 15. When the left sensor appears on the black line, the robot rotates to the left on the black line as shown in Figure 16. If the right sensor detects the black line, the robot will turn to the right until both sensors are on the white surface. When the white area appears, the robot moves forward again Figure 17. The sensor is displayed as a black line and the robot stops shown in Figure 18.

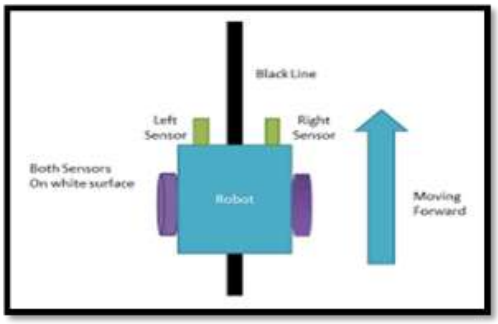

Figure 15

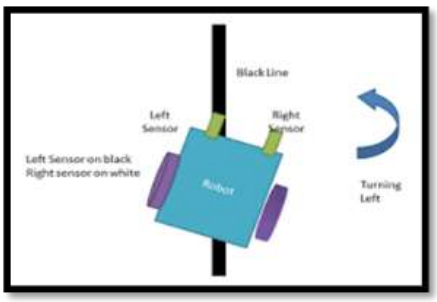

Figure 16

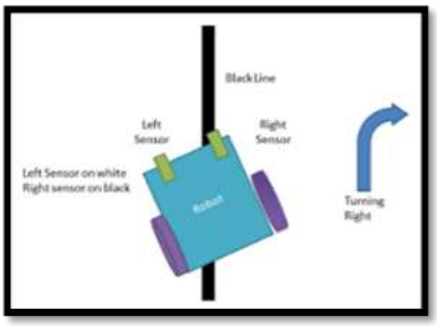

Figure 17

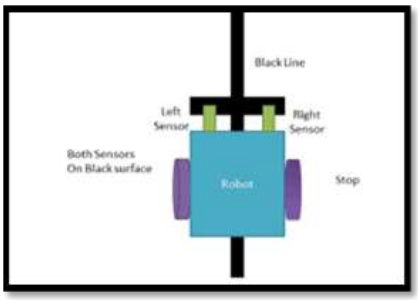

Figure 18

VI. WORKING OF THE PROJECT

Using ultrasonic sensors as shown in figure 19, the line repeater can detect the obstacle and stop until the obstacle is removed.

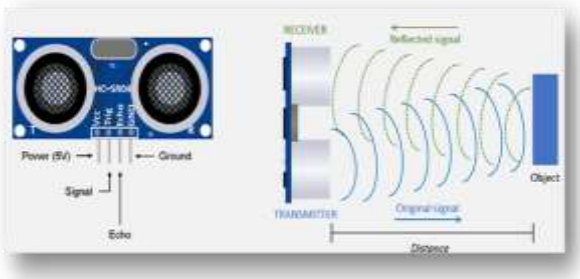

Figure 15 Ultrasonic Line Repeater

For example, if the article is ten cm far away from the sensing element and also the speed of sound is 340 m/s or 0.034 cm/µs, the acoustic wave must propagate for roughly 294 seconds [15]. as a result of the sound wave must move forward and replicate back, the scale of the pen should be doubled. Technical architecture is shown in figure 21. To get the space in centimeters, we tend to multiply the transit note value of the echo output by 0.034 and divide it by 2. Calculation done is as depicted in figure 20 [16].

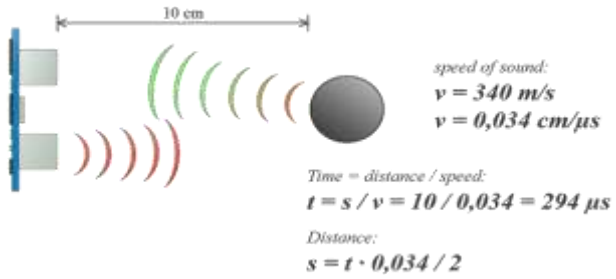

Figure 16 Calculation

VII. TECHNICAL ARCHITECTURE

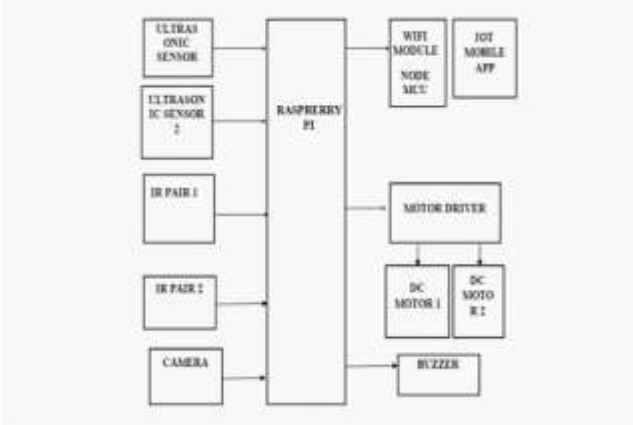

Figure 17 Technical Architecture

VIII. ADVANTAGES AND DISADVANTAGES

Advantages

1. Fully automatic monitoring
2. 24/7 operation
3. Automatic route tracking
4. No human error
5. Non-contact operation.

Disadvantages

1. Need to charge the battery
2. Internet connection required.

IX. CONCLUSION

Since individuals will unfold the virus before they grasp they're sick, it's vital to stay a minimum of six feet faraway from others though you or they are not showing symptoms. Social distance is especially important for people who are at increased risk of overexposure to covid19. In this tail tracking and social distance robot, we can calculate the distance between people and limit the development of viral diseases, especially where social distance is an important factor. Used in all queues of banks, government agencies, shopping malls, theatres, etc.

In the future, we can automatically apply for the future with the help of machine learning, computer vision, thermal imaging, and ultrasound technology.

REFERENCES

[1] Faang, Ho Yun, NaimahYaakob, Mohamed Elobaid Elshaikh, Azami Khairul Sidek, Ong Bi Lynn, and Mahathir Almashor. "IoT-Based Automated and Contactless Shopping Cart During Pandemic Diseases Outbreak." In Journal of Physics: Conference Series, vol. 1962, no. 1, p. 012051. IOP Publishing, 2021.

[2] Nadikattu, Rahul Reddy, Sikender Mohsienuddin Mohammad, and Dr Whig. "Novel economical social distancing smart device for COVID19." International Journal of Electrical Engineering and Technology 11, no. 4, 2020.

[3] Sharma, Shachi, Krishna Kumar Sharma and Himanshu Arora, "A Natural Human-Machine Interaction via an Efficient Speech Recognition System" in International Journal of Applied Information System (IJAIS) - ISSN, New York, USA, vol. 4, no. 9, pp. 2249-0868, December 2012.

[4] G. Soni, V. Poddar, Y. Sahu and P. Suryawanshi, "Hand Gesture Recognition Based Wheel Chair Direction Control Using AVR Microcontroller", International Journal of Advanced Research in Computer and Communication Engineering, vol. 5, no. 3, pp. 344-348, 2016.

[5] Kumar, Adarsh, Kriti Sharma, Harvinder Singh, P. Srikanth, Rajalakshmi Krishnamurthi, and Anand Nayyar. "Drone-Based Social Distancing,

Sanitization, Inspection, Monitoring, and Control Room for COVID-19." Artificial Intelligence and Machine Learning for COVID-19, 2021.

[6] Ravi Khandelwal, Manish Kumar Mukhija, Satish Kumar Alaria, "Numerical Simulation and Performance Assessment of Improved Particle Swarm Optimization Based Request Scheduling in Edge Computing for IOT Applications", New Arch-International Journal Of Contemporary Architecture, vol-8, issue-2, pp. 155-169, 2021.

[7] G. K. Soni, S. Gour, Mr. K. Agarwal, A. Sharma, C. S. Shekhawat, B. Sharma, " IOT Based Smart Agriculture Monitoring System", Design Engineering, Issue-6, pp. 2243- 2253, 2021.

[8] Manish Mukhija, "A Resourceful Technique for virtual Machine Migration in Fog Computing", International Journal of Innovative Science and Research Technology Vol.6, Issue 6, pp 167-170, June 2016.

[9] Kumar, Adarsh, Kriti Sharma, Harvinder Singh, Sagar Gupta Naugriya, Sukhpal Singh Gill, and Rajkumar Buyya. "A drone-based networked system and methods for combating coronavirus disease (COVID-19) pandemic." Future Generation Computer Systems, 2021.

[10] Fu, Shuangquan, and Pritesh Chandrashekhar Bhavsar. "Robotic arm control based on internet of things." In 2019 IEEE Long Island Systems, Applications and Technology Conference (LISAT), pp. 1-6. IEEE, 2019.

[11] Priyanka, P. "Iot Based Covid-19 Patient Health Monitoring System" Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12, no. 12, pp. 4599-4604, 2021.

[12] Pooja Saini, Manish Mukhija, Prakash Dangi, "Design simulation of Efficient Character Recognition System Using Improved Pre-Processing and Feature Extraction Process",Journal of The Gujrat Research Society,Vol.-21, Issue 16, pp. 1883-1889, ISSN: 0374-8588, December 2019.

[13] Ennafiri, M., and T. Mazri. "Internet of Things for Smart Healthcare: A Review on a Potential IOT Based System and Technologies to Control COVID-19 Pandemic." Innovations in Smart Cities Applications, Volume 4, 2021.

[14] Monika Mehra, Manish Kumar, Anjali Maurya, Charu Sharma, Shanu, "MERN Stack Web Development", Annals of the Romanian Society for Cell Biology, 25(6), 11756–11761, 2021.

[15] Zhao, Zhuo, Yangmyung Ma, Adeel Mushtaq, Abdul M. Azam Rajper, Mahmoud Shehab, Annabel Heybourne, Wenzhan Song, Hongliang Ren, and Zion Tsz Ho Tse. "Applications of Robotics, AI, and Digital Technologies During COVID-19: A Review." Disaster Medicine and Public Health Preparedness, pp. 1-23, 2021.

[16] Siddiqui, Shama, Muhammad Zeeshan Shakir, Anwar Ahmed Khan, and Indrakshi Dey. "Internet of Things (IoT) Enabled Architecture for Social Distancing During Pandemic." Frontiers in Communications and Networks, 2021.

[17] Manish Mukhija, "A Resourceful Technique for virtual Machine Migration in Fog Computing", International Journal of Innovative Science and Research Technology, vol-6, issue-6, pp. 167-170, 2016.