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IOT Based Social Distancing and Monitoring Robot for Queue

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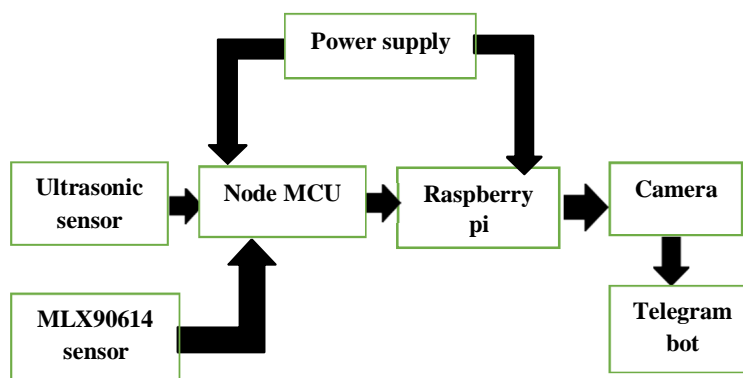
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Abstract: Social distancing plays a pivotal role in preventing the spread of viral diseases illnesses such as COVID-19. By minimizing the close physical contact among people, we can reduce the chances of catching the virus and spreading it across the community. Now it is not possible to station a person 24x7 at each queue to monitoring social distancing violations. This paper aims to provide robot consists of a 4 wheel design system used to drive the robotic vehicle. It uses IR sensing to travel along with queue and another ultrasonic sensor for detecting distance between two individuals in queue. The robot instantly sounds a buzzer to inform about violation and also sends alerts along with camera picture using wifi over iot to inform the higher authorities. This project helps to prevent spread of the virus. To ensure social distancing in queues we hereby design a social distancing monitoring robot.

I. INTRODUCTION

Social distancing is of key importance during the current pandemic. It helps limit the spread of covid by observing distance between disease spreading individuals. Now it is not possible to station a person 24x7 at each queue to monitor social distancing violations. Banks, Public Offices, Malls, Schools, Theatres etc usually see long queues for hours every day. To ensure social distancing in queues we hereby design a social distancing monitoring robot. The robot consists of a 4 wheel design system used to drive the robotic vehicle. It makes use of a line following principle to constantly move along with the queue and monitor for social distancing violations. The robotic uses IR sensing to travel along with the queue to and fro in order to detect violations. The robot is now equipped with obstacle detecting ultrasonic sensor in order to detect obstacles in the vehicle path. The robotic vehicle uses another ultrasonic sensor for detecting distance between 2 individuals in a queue. If any 2 individuals are found having less than 3 feet distance between them, The robot instantly sounds a buzzer to inform about violation and also sends alerts along with camera picture using wifi over iot to inform the higher authorities/head office to update them about violations with proof so instant disciplinary action can be taken.

BLOCK DIAGRAM

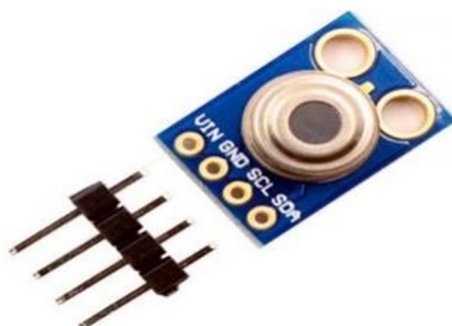


II. BLOCK DIAGRAM DESCRIPTION HARDWARE SPECIFICATION

- 1) *Ultrasonic Sensor:* An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).



- 2) *MLX90614 Sensor:* The MLX90614 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.



- 3) *NodeMCU ESP-12E:* NodeMCU is an open-source Lua based Firmware and development board specially targeted for IoT based Applications. The NodeMCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.



- 4) **DC Motor:** DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.



- 5) **Web Camera:** A webcam is a video camera that feeds or streams an image or video in real time to or through a computer to a computer network, such as the Internet. Webcams are typically small cameras that sit on a desk, attach to a user's monitor, or are built into the hardware.



- 6) **Buzzer:** A buzzer or beeper is an audio signaling device that are mechanical, electromechanical or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power are directly connected to a continuous sound.

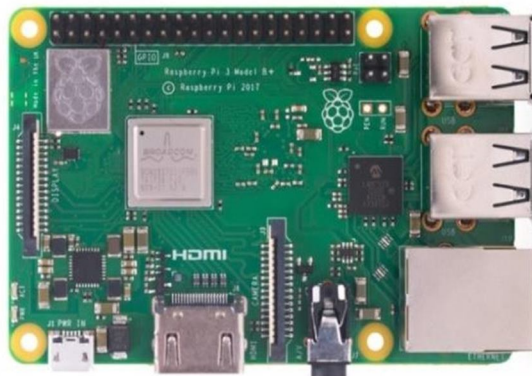


- 7) **5V Relay Module:** Relay is an electromechanical device that uses an electric current to open or close the contacts of a switch. The single-channel relay module is much more than just a plain relay, it comprises of components that make switching and connection easier and act as indicators to show if the module is powered and if the relay is active or not.



III. SOFTWARE SPECIFICATION

Raspberry Pi 3 Model B+ - The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE HAT. The dual-band wireless LAN comes with modular compliance certification, allowing the board to be designed into end products with significantly reduced, wireless LAN compliance testing, improving both cost and time to market. The Raspberry Pi 3 Model B+ maintains the same mechanical footprint as both the Raspberry Pi 2 Model B and the Raspberry Pi 3 Model B. Extended 40-pin GPIO header, Micro SD port for loading your operating system and storing data, 5V/2.5A DC power input.

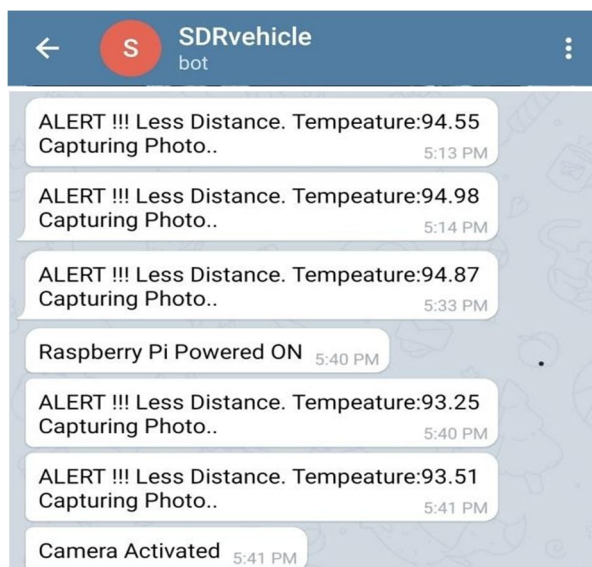
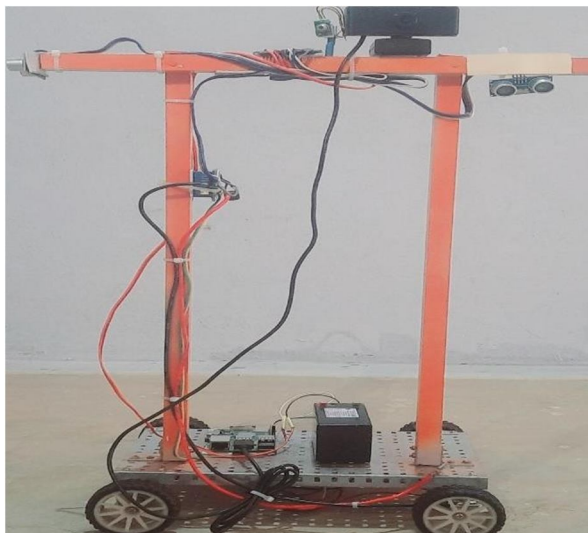


- 1) *VNC Viewer*: In computing, Virtual Network Computing (VNC) is a graphical desktop-sharing system that uses the Remote Frame Buffer protocol (RFB) to remotely control another computer. It transmits the keyboard and mouse events from one computer to another, relaying the graphical-screen updates back in the other direction, over a network. VNC is platform-independent – there are clients and servers for many GUI-based operating systems. Multiple clients may connect to a VNC server at the same time. Popular uses for this technology include remote technical support and accessing files on one's work computer from one's home computer, or vice versa. The VNC server is the program on the machine that shares and allows the client to share control of it. The VNC client (or viewer) is the program that represents the screen data originating from the server, receives updates from it, and presumably controls it by informing the server of collected local input.

IV. PROPOSED METHOD

The model consists of IoT, Raspberry Pi modules, High Resolution Cameras, Robotic body, Ultrasonic sensors, Buzzers etc. It consists of a Raspberry pi module and Node MCU. Raspberry pi camera which helps to capture the image. The robot consists of a 4 wheel design system used to drive the robotic vehicle. It makes use of a line following principle to constantly move along with the queue and monitor for social distancing violations. The robotic uses IR sensing to travel along with the queue to and fro in order to detect violations. The robot is now equipped with obstacle detecting ultrasonic sensor in order to detect obstacles in the vehicle path. The robotic vehicle uses another ultrasonic sensor for detecting distance between 2 individuals in a queue. If any 2 individuals are found having less than 3 feet distance between them, the robot instantly sounds a buzzer and alert to inform about the violation. MLX90614 (GY906) Infrared non contact temperature sensor is used. So, each object emits infrared waves depending on its heat, and these waves are detected using thermopiles which get hotter and hotter, in the same time converting the excess heat to electricity. This sensor measures temperature using a non invasive method. These ultrasonic sensor and MLX90614 is connected to node MCU. MLX90614 will calculate the same person's temperature and send the person's image and temperature to the telegram bot using raspberry pi. Also it sends alerts of these violations along with a camera picture using wifi over iot to inform the higher authorities/head office to update them about violations with proof so instant disciplinary action can be taken. Alert system will be enabled through buzzers. Thus this project allows for automatic maintaining social distancing in queues to prevent the spread of virus.

V. RESULT



The notification of less distance and temperature value is given by the use of telegram bot SDRvehicle. It is the open source that we can gather the information and take necessary steps to avoid these type of violations.

VI. DISCUSSION

In this social distancing and monitoring robot for queue, we can calculate the distance between the individuals and prevent the spread of viral diseases. Using telegram bot SDRvehicle, we can gather the information in the form of notification. These are mainly used in the places where social distancing is the crucial factor. So, this project is used in all linear queues like banks, public offices, malls, theatres etc. In future by using Machine Learning Technique, computer vision, thermal, ultrasound we can implement automatically for future as well.

VII. ACKNOWLEDGMENT

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