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Distance Monitoring Alarm For Covid 19 Using Ultrasonic Sensor

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ABSTRACT

A social solution recommended by World Health Organization (WHO) authorities in this COVID-19 is to cover a physical distance of six feet, a mandatory safety measure in shopping centers, schools and other crowded areas. In this COVID-19 environment, everyone is conscious about their safety, so we came up with the idea of developing this novel device. Most of the time, our focus is on the people in front and the side of the us, but were not able to monitor the people behind us. The main objective of this project is to maintain social distance between the people. In this proposed work PIR sensor, Ultrasonic sensor and Arduino UNO are used. When the PIR sensor detects motion, the ultrasonic sensor measures the distance between people. If a person is in the critical range of six feet around him, this device will warn the person. If the distance is less than six feet, this buzzer indicates the presence of infected persons.

Keywords: Distance monitoring, Arduino UNO, PIR sensor, Ultrasonic, LED

Introduction

Social distancing is the one of the best way to reduce and avoid Covid-19. It is better to stay at home but we can't avoid some emergencies. This project is to overcome from Covid-19 pandemic. When PIR sensor detects the motion, the ultrasonic sensor used to check the pulses to compute the distance in between the obstacle or a person. This is terminated by converting the pulse back to the distance it takes. After measuring the distance, the information is coded and sent, the LED turns on if the distance is less than six feet and turn off when it is more than six feet.[1] Social distancing is a relatively non-invasive measure that seeks to prevent transmission of the airborne virus by maintaining a set distance between and among people. While using guesswork to maintain social distancing is possible in informal situations, employing technology to implement strict social distancing is the preferred method in a busy workplace. It provides an automated "always-on" system that protects all workers while remaining as unobtrusive as possible to the user [2].

The phrase "new normal" is now used to describe the precautions that society needs to consider to limit or prevent the threat of communicable diseases like COVID-19. Many scientists believe the outbreak of another virus is inevitable at some point in the future; nobody can say with any certainty how severe or prevalent it may be. The new normal, therefore, is to have precautionary measures ready for deployment. For viruses that attack the respiratory system, such as COVID-19, maintaining a physical distance is an effective way of preventing its spread, and contact tracing is an effective way of containing the spread after identifying an outbreak[3].

In many offices, factories, and other workplaces, where people need to be mobile to carry out their work activities, maintaining a safe physical distance becomes a dynamic issue because the proximity between workers is constantly changing. Some workers will move faster than others, and natural traffic bottlenecks will occur within workplaces that lead to closer levels of physical proximity than others. Even the time of day will become more relevant in the context of maintaining recommended distances between co-workers and visitors and tracking those contacts that do happen [4].

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Literature Review

Since the onset of the corona virus epidemic, many countries have used technology-based solutions to prevent the spread of the disease. A brief literature review on some papers are given below. M.Christani (2020) evaluated a virtual social distancing model that helps people to be maintain in public places. They represent four types of vacancy called intimate space, personal space, social space, and public spacing. Based on the distance measurement rule, spaces are measured. The process deals with visual understanding and geometric measurements, homograph estimation, metric reference and density estimation, etc. Secondary analysis involves the detection of two-dimensional people and social distance monitoring of multiple angles and face mask detection using deep neural network detection[5]. L. Shi (2012) discusses ultrasonic non destructive testing methods applied in the hydraulic cylinder production process; Cylinder represents the detection of defects of the raw material of the barrel. With the principle of ultrasonic thickness such as bubbles, cracks, impurities and tests of steel tube thickness; Introduces the method of selecting raw materials through measured thicknesses, detects the defects within the machine process and applies initial qualification tests to the assembled hydraulic cylinders. M. Matsumoto (2017) used to develop a human detection model, an hardware based that approach in which distance measurement using sound wave sensors is used. The distance between the 2 citizenry is decided through the variation within the sound waves accumulated to make a distance variable [6]. The signal strength determines the variation within the distance. Normally the signal strength is decided using RSSI (received signal strength value). The system also track the position of the humans with reference to the received value of RSSI.In this paper, Tsai (2017) defines a system for measuring the temperature through monitoring the radiation of the object in the infrared spectrum. The temperature difference of an objects is observed by a long term on a computer is done by Lab View software, using a measuring device passing through a knowledge acquisition interface.

Problem Statement

Existing method

The infrared (IR) light radiation from the objects in its field or spectra is measured by a passive infrared sensor. Ultrasonic sensor which measures the space of a target object by transmitting the ultrasonic sound waves and it converts into an electrical signal. Based on the above two sensors, There are many distance monitoring and motion detection systems separately.

Motivation

Motivated for keeping a safe distance between people to avoid COVID-19 pandemic is frequently emphasized. Social distancing reduces the spread of disease. Less expensive and simple methodology. Hand held device.

Need for the project

Our device which is used to maintain the social distancing. This can be used in a crowd gathering places like mall, theatre etc. It should be carried by the person either in hands or in the tray which is carried during the shopping etc. The buzzer sound which is used for the physically challenged people to maintain the social distancing between the person .

Proposed Method

The block diagram of this method is shown in (Fig.1.Block diagram). It includes Ultrasonic sensor, PIR sensor, Arduino UNO and LED. We have developed code in Arduino. Each and every part is explained.

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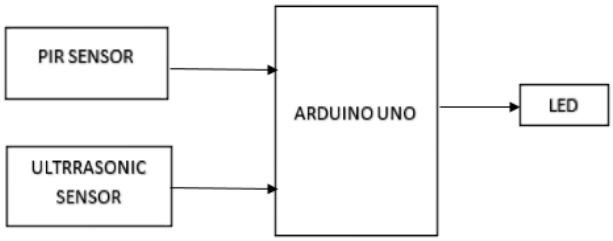

Figure.1. Block Diagram

A passive infrared sensor is an electronic sensor that measure the infrared light radiations from the object in the field. It was mostly used in the PIR - based motion detector. This sensor is commonly used in the security alarms and automated lighting applications. The PIR Sensor allows you to realize motion, and this sensor is used to detect the human motion whether the person is moved out of range. For this reason, the main appliances and equipment is LED in homes or for businesses. They are mostly referred to as "Passive infrared", "pyroelectric", or the "IR motion" sensors. The PIR Sensor is made up of pyroelectric sensor (which you can see in (Fig.2. PIR Sensor) it is a round metal with a rectangular crystal in the center, which is used to detect the level of infrared radiations. Everything in it's emits the low level of radiation, and the warmer it is, and it more radiation is emitted. And this sensor is the motion detector and it was divided into the two parts. The reason for this is we have to finalize the speed change and not the average IR level. In this two halves are removed so it easily cancel each other. If one halves is more or less than the IR radiation than the other output will swing higher or lower.[3]

Figure.2. PIR Sensor

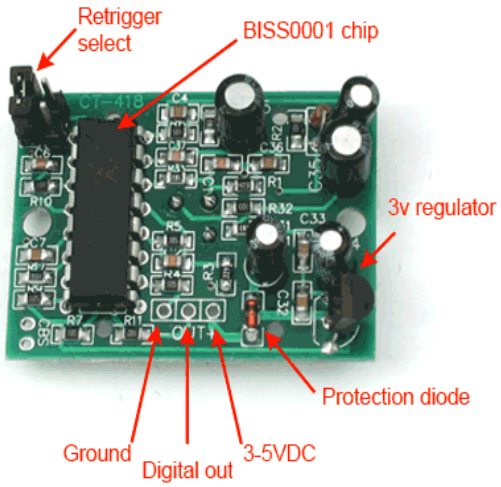

Figure.3. Older PIR

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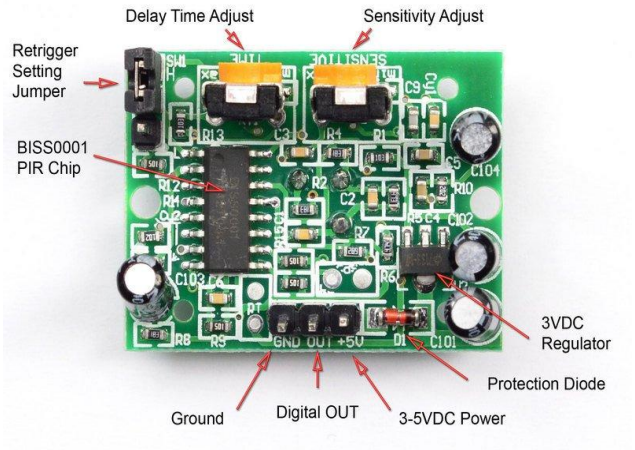

Figure.4. New PIR

Ultrasonic Sensor

Ultrasonic sensor is an electronic device which was used to measure the distance of the object the released ultrasonic sound wave is converted the reflected sound into an electrical signal. Ultrasonic waves travel more faster than the audible sound. Ultrasonic sensor used radar system to operates the same principle. Ultrasonic wave of an acoustic wave single which travels at a 18khz frequency above. The HC SR44 is the famous ultrasonic sensor generates the ultrasonic wave at the frequency of 40khz.

Figure.5. Ultrasonic sensor

In ultrasonic sensor we used microcontroller for the communication purpose. And we used trigger signal to measure the distance between the microcontroller. The duty cycle of the trigger signal is 10 µS for the HC - SR04 ultrasonic sensor. When the eight acoustic wave and begin the time counter. The timer goes off as soon as the amplified (resonant) signal is received. The output of the ultrasonic sensor is high pulse with high duration and the time difference between the transmitted ultrasonic burst received the resonance signal.[6]

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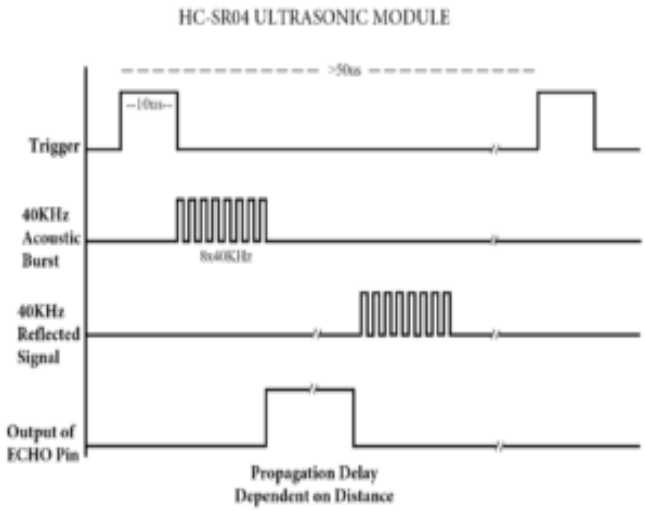

Figure.6. Representation of trigger signal, acoustic bursts, reflected signal and output of echo pin.[1]

Arduino UNO

Hardware

The Arduino UNO Microchip is the open-source microcontroller based on the ATmega328P microcontroller. The board is composed with a set of digital & analog I / O (input/ output) pins that can interfere with various expansion boards and their circuits.

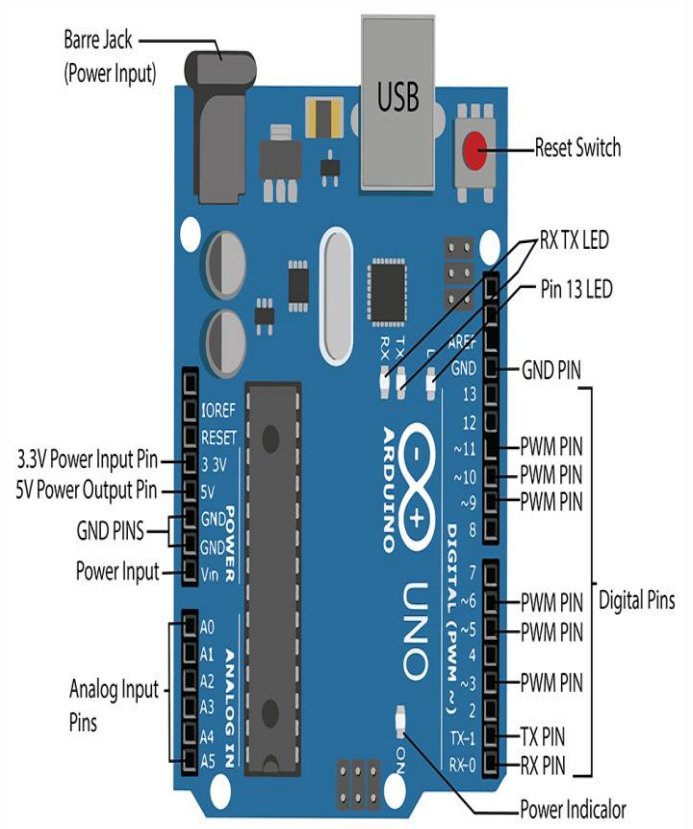

Figure.7. Arduino UNO

Features of Arduino UNO Board

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Arduino UNO comes with the USB interface i.e. A USB board is used in the board to develop the serial communication in the computer. The Atmega328 microcontroller is set up on the board in which have many features like timer, counter, interrupt, PWN, CPU, I/O pin and it was based on 16MHz clock which helps to generate more frequency and number of instruction per cycle. It was an open-source platform, where we can modify and convert boards based on the number of instruction and task which they want to achieve. The reset pin is added to the board which reset the entire board and runs the program. This pin is very useful whenever the board hangs when it was in running process. Pushing pin will clear everything in the program and start it from the beginning. Included on the board are 14 I/O digital and 6 analog pins which allows the external connections with any circuit along the board. This pins provide flexibility and use to external device which was connected through the pins. No fast interface is required to connect the devices. Simply plug the external device to the board pins which was placed on the board as headers. The 6 analog pins which is shown in (Fig.7.Arduino UNO) are marked as A0 to A5 and comes with a resolve of 10 bits. These pins measure from the 0 to 5V, however, they arranged in the higher range using analog reference () function and AREF pins. The number of instruction is stored asa code by the use of 13KB flash memory. Only we need 5V to turn the board, which we can directly achieved using a USB port or the external charger, however, it will support an external power supply of upto 12 V which can be regulated and can be used with 5 V or 3.3 V, which is based on the project requirement.

Software

To create electronics projects, the Arduino serves as a open source prototype platform. The Arduino includes the software and hardware (circuit boards) or IDE, which runs on the computer, where you can wire and upload software code to the hardware board. The Arduino is connected to a computer through the USB and it to the IDE and then uploads it to the microcontroller and then runs it with the program, interacting with both input and output like sensors and motors.

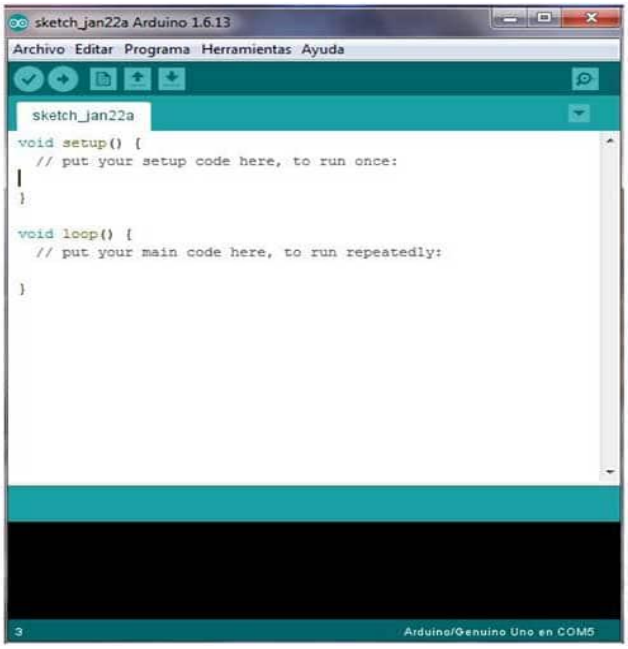

Figure.8. Arduino software

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Flow Chart

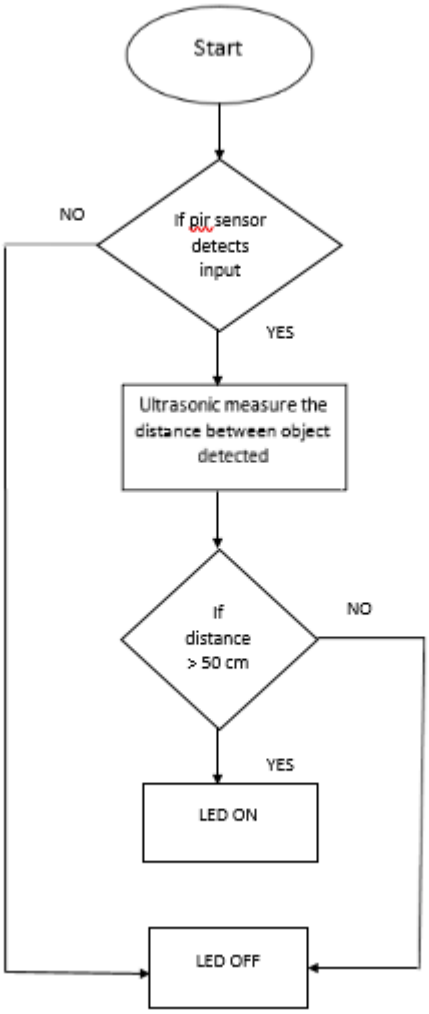

Figure.9. Flowchart

Working

The working of ultrasonic sensor is which transfer the sound wave and receive the echo from a object. To use it in a social distancing sensor have to change the time duration it takes for the pulse to bounce back to measurement in centimeters. After some research, I had come to know that for an ultrasonic sensor to work with program, it had to be coded to fire a high and low pulses. It had produced to a clean pulse from the high pulse. After detecting the resonance of the sensor and the respective pins for the trigger components, it was programmed to turn on the LED when there was an object within 6 feet of distance.

Conclusion

Rapid transit of Covid19 VIRUS enables the researchers to developed various protection systems for the society. The detailed study is done with the help of literature works that is done for the covid19. To protect oneself from this covid19 virus is very important. Finally, the distance value is displayed in serial monitor and led indication is shown when the distance is less than the fixed distance. For future we may also compress this device and can be further implemented with smart watches.

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