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IOT Based Affordable Device for Social Distancing

Tanima Dey, Arghya Kamal Sinha, Ishani Sen, Sumon Sarkar, Anupam Maiti

Department of biomedical engineering, Netaji Subhash Engineering college, Kolkata, India.

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ABSTRACT
In the coronavirus outbreak pandemic by COVID-19, the World Health Organization (WHO) has been issuing several guidelines through all government agencies. In line with those guidelines, social distancing in the population has been a major prevention practice, compelled by all government agencies worldwide. Despite strong recommendations to maintain at least a one-and-a-half-meter distance between the persons, the guideline is not scrupulously followed. To overcome this situation, an IoT-based technical solution is proposed in this paper. The project keeps in mind the above need in this dire situation. We aim to make a Social Distancing Device using HC-SR04 Ultrasonic Sensor with Arduino programming embedded in a case. An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves and converting the reflected sound into an electrical signal.
The proposed device will minimize the possibility of transmission and reduce the infection rate of COVID-19 and aim towards contributing to the safety of the user under these circumstances.

Keywords: **COVID-19**
Ultrasonic Sensor
Safety
Pandemic
Arduino UNO

I. INTRODUCTION

The COVID-19 pandemic was detected in India on January 30, 2020 [1]. Public health experts use the phrase "social distancing" to describe some efforts they take to stop or slow the spread of a highly contagious disease. As we know that the pandemic is going on and the deadly virus is killing thousands of people every day. The coronavirus infection started around 2 years ago; since then, the world hasn't yet fully recovered.The average doubling rate for COVID-19 virus is 7.4 days [1]. Sneezing, coughing, and even talking can produce droplets that carry coronaviruses from one person to another [2] [3]. With advancing, technology people are trying to create new devices which will help everyone to follow the precautions easily.

During these years of the coronavirus pandemic, social distancing has become a

keyword in everyday life.In order to reduce COVID-19 transmission, it is strongly advised by WHO that a minimum distance of 1.5 m be maintained. [4,5,6,7] To maintain that social distancing effectively,especially in a crowded area, our project is very much effective and it is also cost-efficient.

Because the Covid-19 pandemic is caused by the transfer of coronavirus from one infected person to another uninfected person by direct contact, droplets, or indirect contact with a contaminated surface, social distance is required [8,9]. COVID-19 has four steps of transmission. It first arises in travels from other nations in the first stage. The local transmission is the second stage. In the third stage, it has spread throughout the community and is untraceable. The fourth stage develops into a national epidemic. [10]

The European Centre for Disease Prevention and Control reports that as of March 31, 2020 [11, 12], the transmission rate in India was 1.81 [1, 3].Our project revolves around the concept of social distancing. When you're out of the house, keep a 6-foot distance between yourself and others, according to health experts. Our invention includes a proximity sensor and a buzzer. When you're out in public with the device and can't keep a safe distance of 6 feet, the buzzer will start beeping, alerting you to the fact that you're not keeping a safe distance.

A developing platform called the IoT (Internet of Things) allows electronic gadgets and

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sensors to communicate via the Internet to improve lifestyle. [13] Because Arduino is simpler to use andstraightforward for beginners, we chose it for our IOT-based project. We made every effort to keep the cost of our project low, which is why we went for Arduino. Other microcontrollers, such as the Raspberry Pi, were first picked for the project, but since Arduino boards are simpler to maintain and less prone to malfunction, we decided to use them instead. Every segment of society should be able to use and afford this technology.

II. METHODOLOGY

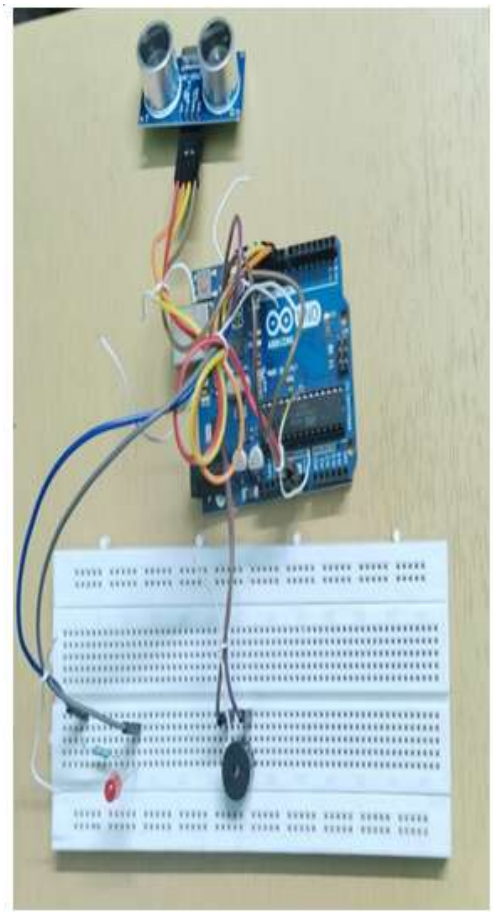
In our endeavor we have taken help of an ultrasonic based sensor – HC SR04 and ARDUINO board to create the social distance measuring device.

The connections are as following

- The HC-SR04 Ultrasonic Module has 4 pins, Ground, VCC, Trig and Echo.
- The Ground and the VCC pins of the module needs to be connected to the Ground and the 5 volts pins on the Arduino Board respectively and the trig and echo pins to any Digital I/O pin on the Arduino Board.
- The HC-SR04 sensor is attached to the Breadboard.
- The Sensor VCC connect to the Arduino Board +5V.
- The Sensor GND connect to the Arduino Board GND.
- The Sensor Trig is connected to the Arduino Board Digital I/O 9.
- The Sensor Echo is connected to the Arduino Board Digital I/O 10.

Buzzer and LED:

- The Buzzer is attached to the Breadboard.
- The Buzzer long leg (+) is connected to the Arduino Board Digital 11.
- The Buzzer short leg (-) is connected to the Arduino Board GND.
- The LED is attached to the Breadboard.
- The Resistor is connected to the LED long leg (+).
- The Resistor other leg (from LED's long leg) is connected to the Arduino Board Digital 13.
- The LED short leg (-) is connected to the Arduino Board GND.



III. RESULTS AND DISCUSSION

From our device we have recorded the sound pitch by measuring the distance.

SL NO.	DISTANCE (cm)	PITCH
01.	Above 180 cm	Low pitch sound
02.	Near 180 cm	Sound exceeds
03.	Below 180 cm	High pitch sound

When the sensor detects that the impediment is more than 180 cm away from the device, the buzzer stops making noise. The buzzer goes off when the obstacle is between 180 to 170 cm away from the gadget, and it makes a low-volume, low-pitched noise. Due to this problem, we used an amplifier in our device for increasing the buzzing sound. The buzzer now produces a high-pitched and loud beeping noise when the object is within 180 cm of the device. As the barrier gets

closer to the gadget, the volume and pitch of the buzzer's sound rise.

IV. APPLICATIONS

- The primary function of an ultrasonic sensor is to determine distance. It has the capability of being utilized as a proximity sensor. Transmitters, receivers, and transceivers are the three main types of ultrasonic transducers. Transmitters transform electrical impulses into ultrasound, receivers convert ultrasound back into electrical signals, and transceivers can send and receive ultrasound.
- Transducers are employed in systems that evaluate targets by reading reflected signals, comparable to radar and sonar. For example, the distance of an object can be estimated by measuring the time between transmitting a signal and getting an echo.
- The usage of an ultrasonic system for object detection is quite beneficial. It can be a helpful resource in the medical area. In Covid19 distance measurement, the ultrasound object detector can be quite beneficial. It can be fitted in a box, which can then be carried around in public.
- In a hospital, an airport, a school, or a college, queue management is essential. When someone comes within 1 meter of the system, it immediately emits a buzzer sound.
- It is a portable device that can be used in fairs and events for crowd management by organisers and volunteers
- Accidents can be prevented with the help of this device in overcrowded places. It will help in preventing a stampede.
- In medical centers or hospitals one can use it on radiology department were optimum distance should be maintained by both the technician and the patient from harmful radiation waves. Without any manual effort the buzzer will help in indicating the safe distance between the radiation device and human body.
- Since the distance is shown on the screen one can use it to measure the length or distance from any object. The device is portable and cost efficient so anyone can be able to afford it.

V. CONCLUSION

The above sensor was investigated, and the Ultrasound sensor was chosen since the results are satisfactory for use in the social distancing prototype system being created. It was utilized to calculate the distance between obstacles that appeared in the course of this prototype.

After successfully implementing the distance measurement technique, the obstacle detection algorithm was successfully implemented in Arduino with low errors. Our device is craftily created to be a very low-cost, pocket-friendly device for users. The results reveal that the results for the measured distance of 6 feet are satisfactory for use in the social distance maintaining system that is currently being practiced. For most practical applications, the accuracy of the obstruction distance will suffice.

Other devices and systems that require the measurement of the distance of an item or an impediment from a stationary or moving observation can readily incorporate the system. Obstacle detection is a useful tool for avoiding the transmission of the Coronavirus in public spaces.

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