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Wireless Distance Detector Using IOT

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ABSTRACT
The aim of the project is to develop a wireless distance detector using Node MCU module. The sensor works by emitting the ultrasonic waves from the ultrasonic sensor to measure the sound wave that bounce back from the object .When Ultrasonic sensor detects the object it monitor the distance between the object. The Node MCU, which has been configured with data on the object detecting range. During the detection process ultrasonic sensor detects the object closer than a preset distance if the object is below the defined range the Piezo buzzer will start beeping while indicating the object. The ArduinoIDE serialmonitor can be used to track and analyze the distance data. For security considerations, the initiative will be implemented across a variety of industries. The system is designed to be compact and portable and easy to use. The project's primary goal is to include motion sensingto unlock doors in metro stations. Passengers on the platform at a train station should follow the platform caution line as the train approaches. The detection of wild animals in forested areas and the detection of object penetration into electric fences.
KEYWORDS: *Buzzer alarm, Ultrasonic sensor, Object, Arduino Uno.*

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I. INTRODUCTION

In the modern world of technology are moving towards the digital world of automation. The internet of things has been grown faster in the recent times. The advancement in technology occurs through wireless communication using sensors By Implementing wireless distance measurement is one of the applications in automation sector's uses for security. The development of sensing devices that can remotely monitor and control numerous physical factors is one of the main uses of the Internet of Things. One such metricthat has several uses in fields like robotics, automation, and security is distance detection. NodeMCU is an open source microcontroller based on the ESP8266 wifi module. Wireless distance detector uses an ultrasonic sensor to enable remote sensing and monitoring of item distances without physical touch. The distance between the sensor and the target object is measured using ultrasonic waves, which are sound waves with a frequency higher than theupper limit of human hearing. The sensor releases a sound wave that travels through the air and bounces off the object. Thesensor takes time how long it takes for the wave to return. The sensor can calculatethe distance between an object and itselfby measuring the time it takes for the sound wave to go there and back. The Ultrasonic sensor works on the principle of sound waves travelling from the emitter to the receiver. The hardware used was anArduino Uno connected to a LEDs, Buzzer, and Ultrasonic sensor via a breadboard. The Arduino IDE was used to create and store the circuit's operating programme in the Arduino microcontroller's memory. Based on the study, the sensor may be used to display distance values on the Serial monitor and properly determine the position of an approaching object. A wireless distance detector is a device that uses wireless communication to calculate the distance between two objects or places. Using a wireless communication technology like Bluetooth, Zigbee, or Wi-Fi, the distance data from the sensors is then wirelesslytransferred to a receiving device or system.

Numerous applications, such as smarthomes, industrial automation, robotics, andnavigation, can make use of these devices.

II. LITERATURE REVIEW

This Paper presents the design and implementation of wireless distance detector using ultrasonic sensor using Node MCU in IOT. The ultrasonic sensor detects the distance between the object by sending out a high frequency sound wave to measure the distance and bounce back from an object. The distance of the object

is calculated based on the speed of sound. The sensor measures the intensity of the reflected sound wave to detect the presence of the object based on their size and shape. Ultrasonic sensor uses transducer to generate and receive sound waves. The transducer consists of piezoelectric crystal that converts the electrical energy into mechanical vibration. It produces a high frequency sound wave travelled through air. The experimental result shows that the system is accurate and efficient. Some of the key challenges are used for security such as Data privacy, Device authentication, Network security, physical security etc. To address the security the privacy, integrity, availability of the data generated by the system to prevent from unauthorized access and malicious attack. The Wireless distance measurement can be used in wide range of application such as distance measurement, object detection, motion detection, flow measurement etc.

1. A Wireless Distance Measurement System Based on Ultrasonic Sensors for IoT Applications by J. Zhang et al. (2019).This study proposed a wireless distance measurement system based on ultrasonic sensors for IoT applications. The system consists of an ultrasonic sensor, a NodeMCU development board, and a wireless module. The system can measure the distance between the ultrasonic sensor and the target and transmit the measurement data to the cloud platform for further processing. The study demonstrated the feasibility and effectiveness of the proposed system in practical applications (1).

2. "Wireless Ultrasonic Distance Measurement System for Industrial Applications" by R. Z. Khan et al. (2020) this study proposed a wireless ultrasonic distance measurement system for industrial applications. The system consists of an ultrasonic sensor, a NodeMCU development board, and a wireless module. The system can measure the distance between the ultrasonic sensor and the target and transmit the measurement data wirelessly to a remote server. The study demonstrated the effectiveness of the proposed system in industrial applications such as warehouse management, object detection, and parking management (2).

3. "A Wireless Ultrasonic Sensor Network for Distance Measurement in Industrial Applications" by J. Zhang et al. (2019).This study proposed a wireless ultrasonic sensor network for distance measurement in industrial applications. The network consists of multiple ultrasonic sensors, a NodeMCU development board, and a wireless module. The system can measure the distance between the ultrasonic sensors and the target and transmit the measurement data wirelessly to a cloud platform. The study demonstrated the feasibility and effectiveness of the proposed network in practical applications such as object detection and obstacle avoidance (3)

III. METHODOLOGY

The ultrasonic sensor measures the distance between an object before sending the information to the NodeMCU. The data is read by the NodeMCU before being sent to a remote server or cloud platform via the Wi-Fi module. The data is kept on the remote server or cloud platform and is accessible through a web interface or app.

A sensor or other connected devices may be remotely controlled because toward the possibility of bidirectional data transfer. The NodeMCU's programming can enable two-way communication between the sensor and the distant server, enabling the server to provide information to the sensor to control its performance. It's important to note that this is a high-level data flow diagram and the actual data flow may be more complex and include additional components or processes depending on the specific implementation requirements.

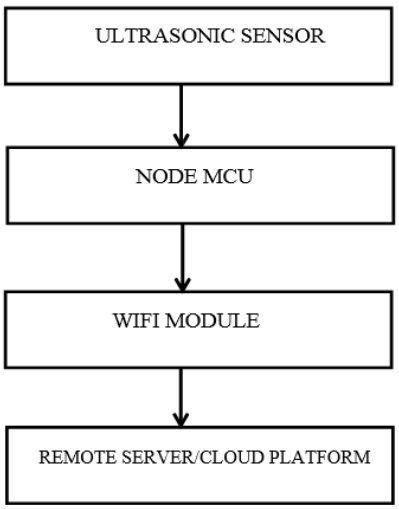

Fig 1: Working Module

3.1 WORKING PRINCIPLE

The wireless distance detector is developed to measure the distance betweenthe object using ultrasonic sensor. The sensor collects the data using high frequency sound wave to detect the object at the range of 20 kHz and 200 kHz. The speed of sound wave in air is nearly 344 m/s

Fig 2: Ultrasonic Sensor

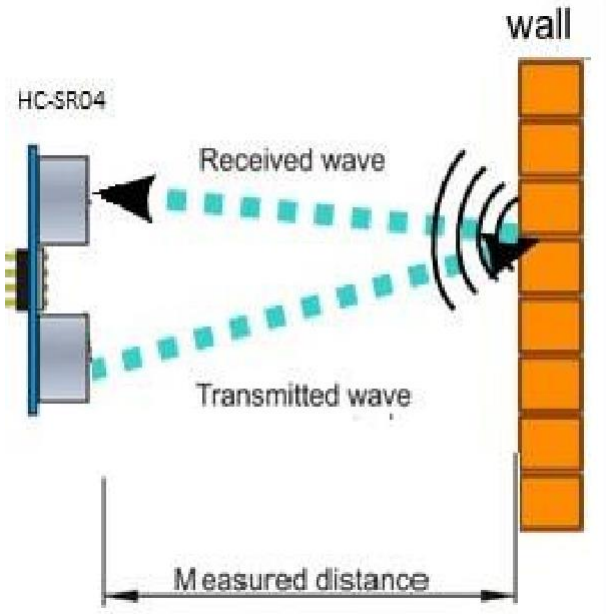

Fig 3: Ultrasonic sensor Signal

The distance between the object is calculated based on the speed of sound waves in air. The Formula to calculate the distance is:

Distance = Speed of Sound wave *time/2

The time and speed are the parameter used to calculate the distance travelled by the sound wave.

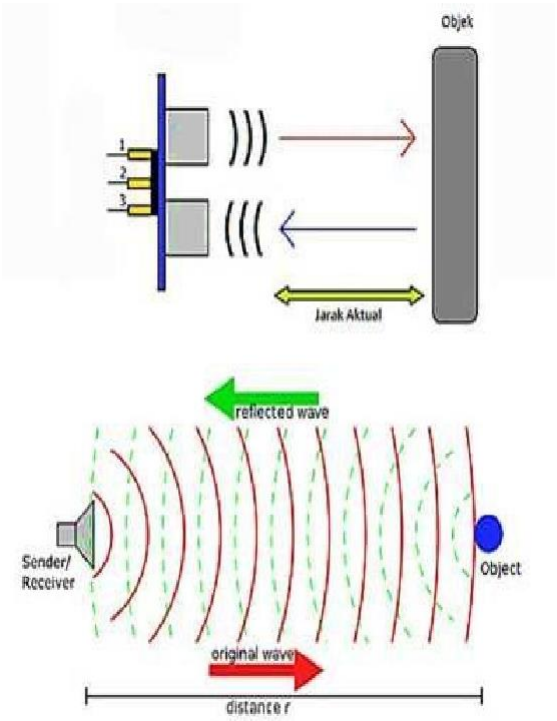

Fig 4: Distance Measurement

IV. RESULT AND DISCUSSION

In IoT applications for distance sensing and monitoring, the wireless distance detector using an ultrasonic sensor has demonstrated promising results. A reliable, inexpensive, and effective solution for measuring remote distances is provided by the combinationof ultrasonic sensors and IoT technologies. The results of the technology have been observed to be accurate and reliable, with minimal errors in distance measurement. The sensor can detect objects at a distance of up to several meters, making it suitable for a wide range of applications.

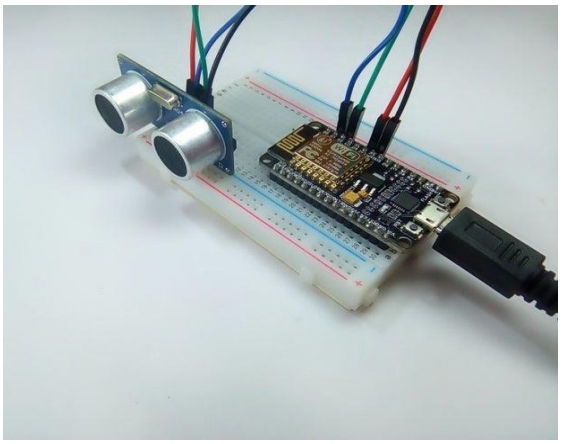

Fig 5: Final Hardware part of project

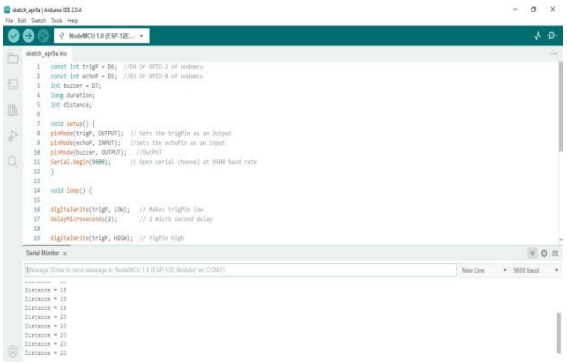

Fig 6: Distance in Serial Monitor

V. CONCLUSION

In conclusion, a promising technology that enables remote sensing and monitoring of distances between objects and sensors in wireless distance detector employing ultrasonic sensor in IoT. It is a practical, reliable, and affordable solution with many uses across numerous sectors. Object detection, security, and automation could all be enhanced by this technology in a wide range of industries including manufacturing, transportation, and agriculture. It provides a practical approach to remote object monitoring and can assist to improve procedures, lower expenses, and continue strengthening. Overall, the wireless distance detectorwith an ultrasonic sensor for the Internetof Things is a useful technology with a promising future.

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