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Reverse Car Parking Sensor

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Abstract - *This paper illustrates the configuration of a parking sensor that help the driver while reversing the car for parking. Sometimes it can be difficult to judge the distance when reversing the car. On off the change that the driver is inexperienced in driving it can cause potential damage to the car or can lead to some other casualties when reversing the car for parking. This sensor can prove quite helpful in such situations. This sensor can be installed without much of a stretch at the rear of your vehicle. An additional feature of this sensor is that the number of beeps increases as the car nears any object so that the driver can estimate the distance between the object and the car. This article discloses on how the Reverse Parking Sensor is configured.*

Key Words: Arduino, UNO, Ultrasonic sensor, Parking sensor, Navigation, Microcontroller, Hardware components.

1.INTRODUCTION

Nowadays, parking a vehicle is one of the most important skills for any driver or car owner as it is very difficult to measure the space around the vehicle and to know the bumpers. Parallel parking often requires a lot of practice therefore to solve this problem; a parking sensor has to be developed that makes it easier to park the vehicle. Parking sensors are proximity sensors that the driver can use to identify nearby vehicles when parking. As a rule, the car manufacturer places these sensors on the rear bumper of the vehicle, which is why this system is also known as a driver assistance system. [1] Currently, the popularity of these sensors has increased due to the increase in vehicle size and the decrease in parking spaces. So, for this purpose we have made use of ultrasonic sensor along with

Arduino in order to detect and park the car carefully without any problem. The ultrasonic sensor plays a key role in detecting objects using high frequency sound waves. It generates sound pulses that ricochet off nearby objects. [2] The receiver perceives the reproduced waves and estimates the distance between the car and the object. It is connected to an alarm device. In order to warn the driver if an obstacle is approaching the vehicle. When the driver engages reverse gear, the parking sensor automatically activates and sends ultrasonic signals. When these signals hit a nearby object, they are immediately replicated and recorded by the parking sensors. signals, the engine control unit measures the distance between the vehicle and the object. When the car approaches the object, the alarm system warns the driver with a beep to prevent the vehicle. [2]

2. THE KEY TECHNOLOGIES

The key technologies of the reverse car parking sensor module have mainly several technologies as follows:

1. Hardware specifications
2. Software specifications
3. Flowchart

1.1 Hardware Specifications

1. Arduino UNO: UNO in Arduino board is termed as 'one' in Italian language. It was the first version developed in the Arduino software therefore it is called as Arduino UNO. It is related to the ATmega328P microcontroller. It is comparatively easier and simpler to use than its other versions. The Arduino UNO consists of 6-pin analog, 14-pin digital inputs, a USB port, a socket and an ICSP header. It is programmed on the basis of IDE, which means an integrated development environment. on online and offline platforms [3].

2. HC-SR04 Ultrasonic sensor: With the help of SONAR technology this ultrasonic sensor detects the distant objects. The HC-SR04 measures the distance to an object with the help of the transmitter and receiver placed in front of it. The transmitter fires out beams of ultrasound frequency that reflects from the objects, and the receiver receives it with an echo. This echo then further goes for the processing part in order to calculate the difference in time. On the basis of the calculated time we can determine the distance between the object and the sensor. [6]

3. BC548 NPN Transistor: It is used for amplification and switching purpose. It has three terminals i.e. emitter, base and collector which are used for connections. The terminals of this transistor is used to control the current by other pair of terminals. [7]

4.1N4007 PN Junction diode: For the AC/DC conversion of current it is used. It is a rectifier diode having PIV of 1Kv. [8]

1.2 Software Specifications

The proposed configuration of the project includes an ultrasonic sensor. A program for the execution and operation of the integrated circuit of the sensor is essential. Arduino programming is used to build the program, given that it is an easy language to understand and commonly used programming language. The software configuration is implemented to detect that distance between the vehicle and the obstacle and increase the intensity of the buzzer accordingly. The execution of the configured software begins with analyzing the distance between the rear of the vehicle and the obstacle within its vicinity. The estimation of duration for which the ECHO Pin is HIGH is done by using the pulse In function of Arduino using the logic: duration = pulse In (echo_1, HIGH);. The distance is calculated in centimeters using the code: distance = duration / 58.2. The code is thereby configured to increase the number of beeps as the vehicle nears the obstacle so as to help the driver to judge the distance between the rear of the vehicle and the obstacle [4].

1.3 Flowchart

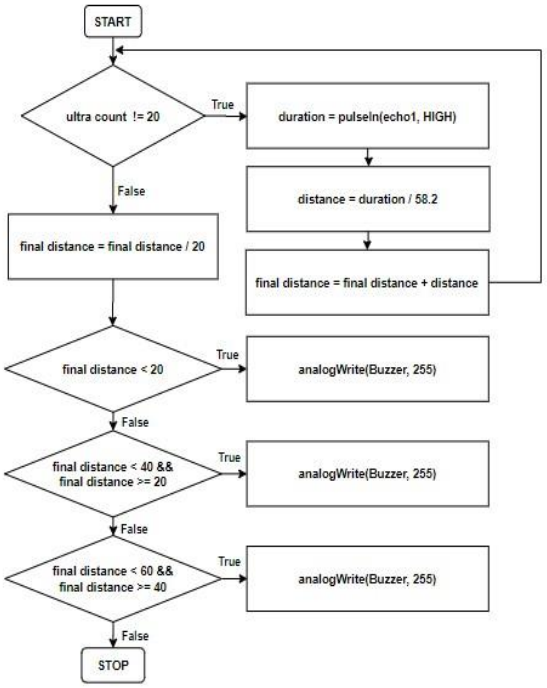


Fig1. Flowchart of the reverse car parking sensor module

3. SYSTEM OPERATION AND ARCHITECUTRE

Design of Reverse car parking sensor: The implementation of the reverse car parking sensor is quite simple. Firstly, the ultrasonic sensor comprises of 4 pins: VCC, TRIG, ECHO and GND. Out of these pins, VCC and GND pins are connected to a +5V and GND. TRIG and ECHO pins are then connected to digital I/O pins for almost 11 or 10 Arduino Pins respectively. In the circuit, the buzzer used is a 5V buzzer, along with 1N4007 Transistor and 1KΩ resistor (at the base) to control the buzzer.

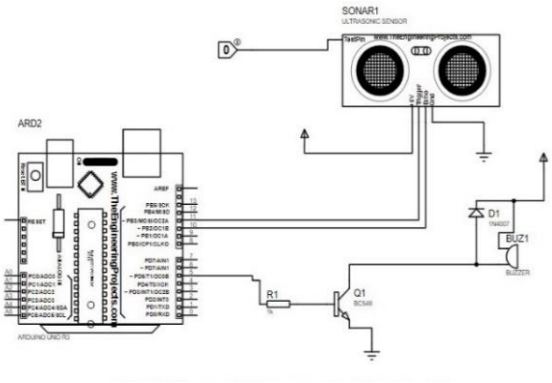


Fig. 2 Circuit diagram as simulated on proteus software

The measurement of the distance is done by the Ultrasonic Sensor. Controlling the ultrasonic sensor, calculation of the distance and the activation of the buzzer is done by Arduino UNO. The emission of acoustic pulses is done by the ultrasonic sensor. The Arduino calculates the interval of each reflected signal. The estimating of the distance to the object is done by the Arduino on the basis of the time delay [9]. When the distance between the installed sensor and the object is less than the specified range the Arduino triggers the buzzer. The Arduino estimates the range of the hindrance in front of the ultrasonic sensor, when the circuit is activated.

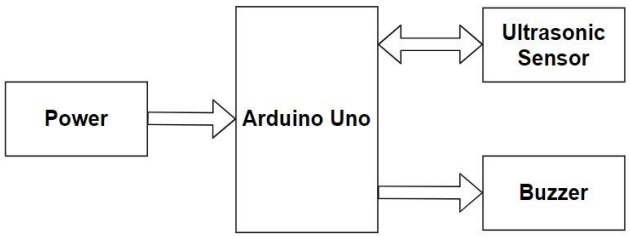
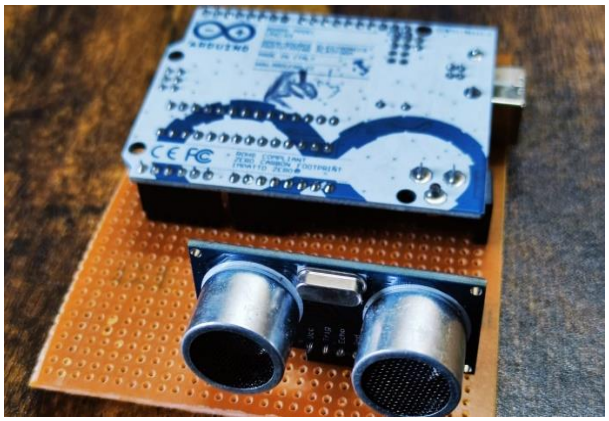


Fig 3. Block diagram of reverse car parking sensor

If the calculated distance is less than 100 cm, the Arduino activates the buzzer, in order to increase the frequency of the acoustic signals as the distance decreases, the code can be changed [4].

4. RESULT AND DISCUSSION



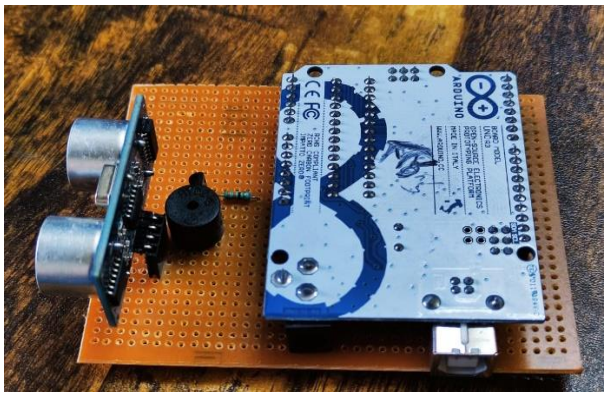


Fig 4. Reverse Car Parking Sensor Module

Stages	Distance (cm)	Buzzer Frequency (Hz)
1	0 - 19	255
2	20 - 39	100
3	40 - 59	50

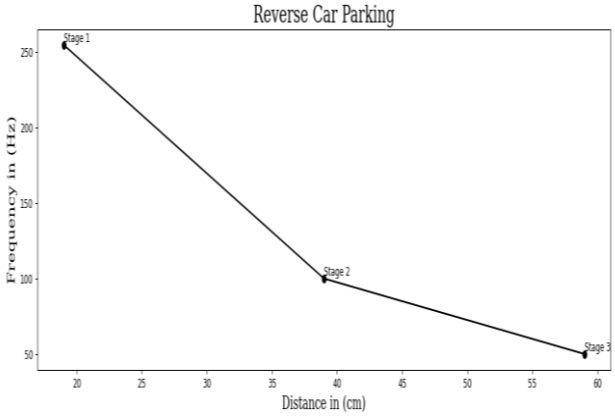


Fig 5. Graph representation of distance vs buzzer frequency

The distance obtained by the model is compared on 3 stages. First when the object is in the distance of 0 to 19 cm, where the buzzer will buzz at frequency of 255 Hz. Second is the distance from 20 to 39 cm and buzzer frequency will become 100 Hz and lastly the third stage of distance from 40 to 59 cm with buzzer frequency of 50 Hz. Thus, intensity of the buzz increases as the object comes closer.

5. CONCLUSIONS

5.1 Innovation Point

Although science and technology have developed and evolved a lot, it is more about computers, cars etc. We know that in the automotive sector, many countries are doing well and bringing new products (vehicles) to the market. Although there are many features available in these vehicles, one specific feature that is not quite available in budget-oriented vehicles is the reverse parking one. To tackle this issue, we have developed a sensor that assists the driver while reversing the car while parking.

Finally, we would like to conclude our design process briefly. Obstacle in the desired are, using the Arduino controller, using the Arduino controller, controlling these ultrasonic sensors via our pre-installed program. The buzzers are used to indicate the obstacles that are under its beam.

5.2 System Advantages

1. Provides diverse function and complete services
2. The number of beeps increases as the car nears any object.
3. Low cost and economical
4. Optimize the configuration of the parking lot.

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