

Vehicle Door Open Warning and Locking Safety System

Submitted in partial fulfillment of the requirements
for the award of
Bachelor of Technology degree in Information Technology by

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**DEPARTMENT OF INFORMATION TECHNOLOGY
SCHOOL OF COMPUTING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of Murugadoss R (37120049) and Saravanan S (37120064) who carried out the project entitled "Vehicle Door Open Warning and Locking System" under our supervision from November 2020 to March 2021.

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DECLARATION

We are Murugadoss R and Saravanan S hereby declare that the project report entitled on **“Vehicle Door Open Warning and Locking System”** done by us under the guidance of Dr. R Jeberson Retna Raj, M.Tech., Ph.D., is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Information Technology.

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I am pleased to acknowledge my sincere thanks to **Board of Management of SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

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ABSTRACT

A vehicle door open warning and locking safety system have been introduced to solve the problem of vehicle target collisions that appeared earlier when the driver and passenger. The car door opening alert system includes signal detectors for detection. When a car returns while someone opens the car door, when the Ultrasonic sensor detects another car from behind, Arduino processor will allow the car door control unit to prevent the car door from opening. Visual warning of light and Audio warning of buzzer will be activated. It is activated to provide visual and audible warning signals when the car door is opened and the highest safety provided is the door will be locked with the help of the car door Lock Actuator and will not allow the person to open the door while the vehicle has been detected.

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LIST OF SYMBOLS AND ABBREVIATIONS

IOT	Internet of Things
VDOWLS	Vehicle Door Open Warning and Locking System
EEPROM	Electrically Erasable Programmable Read-Only Memory
SRAM	Static Random-Access Memory
VCC	Voltage Common Collector

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Due to the rapid development of technology and user interest in driving safety, vehicle safety technology is becoming increasingly popular. Due to the high incidence of motor vehicle accidents in recent years, driving safety is one of the hottest and the most worrying. The support system has the potential to improve the quality of road transportation and reduce driving entertainment. In the future, driving assistance will play an important role in protecting drivers and passengers and preventing accidents.

The World Health Organization reports that more than 120 million people die each year in road accidents, and recently 5 billion people have disabilities. For many years, little attention was paid to the area behind the vehicle before opening the doors leading to oncoming vehicles, including oncoming vehicles and bicycles.

This resulted in primary and secondary damage to the front-wheel drive driver, which accounted for 11.6% of the total number of people with disabilities, delayed access to the lane and leads to falls, with 5.3% of all deaths. Work Technology that can prevent these accidents. Scientists and experts use vision and radar technology to determine the purpose of entering the warning zone behind the car.

When a car driver or a person in a car is opening a car door of the car, the driver or person may be unaware of a car or moving object from behind, causing an accident. Even an experienced car driver may be unable to control any person sharing the car from opening the car door upon a sudden approaching of car or object from behind. Further, a vehicle may be equipped with a variety of signal lights, however, no warning light is designed to give a visual pre-warning signal when a car door is going to be opened.

The present invention has been accomplished under the circumstances in view. It is one object of the present invention to provide a vehicle door opening warning system, which gives audio and visual warning signals when the car door is being opened. It is another object of the present invention to provide a vehicle door opening warning system, which limits the opening angle of the car door when a sensor at the car door senses the approaching of a car from behind.

1.2 OBJECTIVES

A vehicle door open warning and locking safety system have been introduced to solve the problem of vehicle target collisions that appeared earlier when the driver and passenger. The car door opening alert system includes signal detectors for detection. When a car returns while someone opens the car door, when the Ultrasonic sensor detects another car from behind, Arduino processor will allow the car door control unit to prevent the car door from opening.

Visual warning of light and Audio warning of buzzer will be activated. It is activated to provide visual and audible warning signals when the car door is opened and the highest safety provided is the door will be locked with the help of the car door Lock Actuator and will not allow the person to open the door while the vehicle has been detected.

A door opening assistant for a motor vehicle is specified. This comprises an environment sensor system for monitoring at least the lateral area of a vehicle, a device for detecting an opening of a vehicle door or the intention of a vehicle occupant to open a door or an already opened door, an evaluation unit for carrying out a situation analysis, wherein it is evaluated whether at least an environment object is located in a danger area to the side of the vehicle or will enter the area within a predetermined time and a warning or a door

locking device to prevent the opening of the vehicle door when at least one environment object is in the danger zone or could enter the danger zone.

1.3 IOT TECHNOLOGY AND VDOWLS:

1.3.1 IOT concept and Definition:

Internet of things IOT consists of two words Internet and Things The term things in IOT refers to various IOT devices having unique identities and have capabilities to perform remote sensing, actuating and live monitoring of certain sort of data. IOT devices are also enable to have live exchange of data with other connected devices and application either directly or indirectly, or collected data from other devices and process the data and send the data to various servers.

The other term internet is define as Global communication Network connecting Trillions of computers across the planets enabling sharing of information .Thus the IOT can be define as :”A dynamic Global Network Infrastructure with self-configuring capabilities based on standard and inter operable communication to protocol where physical and virtual things have identities, physical attributes ,and virtual personalities and use intelligent interfaces and are seamlessly integrated into the information network ,often communicate data associated with user and their environment.”

An ideal IoT device consists of various interfaces for making connectivity to other devices which can either be wired or wireless. Any IoT based device consists of following components such as I/O interface for Sensors. , Interface for connecting to Internet, Interface for Memory and Storage, Interface for Audio/Video devices can be of various forms like wearable sensors, smart watches, IoT smart home monitoring, IoT intelligent transport systems, IoT smart health devices etc.

1.3.2 IOT in VDOWLS SYSTEM:

In order to solve the problem of a vehicle colliding with a target that previously occurred in a collision between a driver and a passenger, a warning and locking system for opening the door has been introduced. The car door open warning system includes a signal detector for detection. The ultrasonic sensor detects another car from behind. The Arduino processor enables the door controller to prevent the door from opening. The control indicator light and the sound warning buzzer are on. When the door is opened, it is activated to issue a visual and audible warning signal, and provides additional safety by locking the door with a door lock actuator and preventing someone from opening the door when the car is detected.

A door opening assistant for a motor vehicle is specified. This comprises an environment sensor system for monitoring at least the lateral area of a vehicle, a device for detecting an opening of a vehicle door or the intention of a vehicle occupant to open a door or an already opened door, an evaluation unit for carrying out a situation analysis, wherein it is evaluated whether at least an environment object is located in a danger area to the side of the vehicle or will enter the area within a predetermined time and a warning or a door locking device to prevent the opening of the vehicle door when at least one environment object is in the danger zone or could enter the danger zone.

- The environment sensor for monitoring at least the lateral area of a vehicle. This is designed, for example, as a radar, lidar, camera or ultrasound system or as a combination of a plurality of said sensors. The sensors are preferably on the vehicle side. Arranged in the side mirror area. In a particular embodiment, the selected environment sensor system considers the entire environment of the vehicle. The environment sensor detects existing road users (objects), their relative position and preferably their relative speed.

- A device for detecting an opening of a vehicle door or the intention of a vehicle occupant to open a door or an already open door. For this purpose, either a sensor may be provided which detects the state of the door (opened or locked) or actuation of the operating element for door opening by the driver. Another embodiment of the invention provides that the intention to open a door is detected with a proximity sensor. So, the approach of a hand to the control or the touch of the same determined by an infrared sensor or by a capacitance measurement.

1.3.3 Benefits of VDOWLS System:

An evaluation unit used for condition analysis, in which it is evaluated whether environmental objects enter the potentially explosive area on the side of the vehicle within a specified time or enter the area. The relevant environmental objects are road users, such as cars, motorcycles, cyclists, pedestrians, etc., who are near the vehicle, usually stop or approach the vehicle, and check whether any future collisions with the occupied area are possible Will open the car door.

- A warning or a door locking device, for preventing the opening of the vehicle door when at least one environment object is in the danger zone or could enter the danger zone. Should there be a possible collision on a vehicle side and an occupant actuate or approach a vehicle door handle on the corresponding side of the vehicle, in a positive embodiment of the invention an optical warning is issued, by an LED flashing light preferably on the door handle. Additionally, or alone, in a preferred embodiment of the invention, an acoustic signal, for. issued a warning sound on the respective vehicle side.
- In further positive embodiments of the invention are haptic warnings of the occupants. As vibration of the respective door handles, temporary locking of the affected vehicle doors, or damping / blocking the door opening

movement, alone or in combination with other warnings provided. In a further embodiment of the invention, in the event that a vehicle door is already open, before a road user approaches threatening, also a warning will be issued. By the mentioned the occupants are made aware of a dangerous situation and can, if necessary, defuse them by omitting or delayed door opening.

1.4 METHODOLOGY:

The most typically technology was microwave radar based mostly sensors, that were generally mounted within the rear bumper and observe vehicles that were along with or slightly behind the vehicle.

When an automotive return whereas someone opens the automotive door, once the unhearable device detects another car from behind, Arduino processor can enable the door management unit to forestall the car door from opening.

Visual warning of light and audio warning of buzzer will be activated. it's activated to produce visual and hearable warning signals when the door is opened and also the highest safety provided is that the door are going to be latched with the assistance of the automotive door Lock mechanism and will not enable the person to open the door whereas the vehicle has been detected.

CHAPTER 2

LITERATURE SURVEY

2.1 Project Title: Car Door Safety System, Google Patents, 2019

Objective:

The present invention relates to a safety device for automobiles and, more particularly, to a safety device for preventing the door of an automobile from accidentally slamming on a person's hand or fingers.

Techniques:

Interfacing sensors

Zig-Bee modules

Camera

Actuators with small scale controller and raspberry.

Advantages:

- A first switch means disposed on an exterior side of the automobile door;
- A second switch means disposed on an interior side of the automobile door;
- A control circuit responsive to the first and second switch means; and
- A door closure preventing means effective for preventing the automobile door from fully closing in response to a signal from the control circuit, the control circuit being effective to normally activate the door closure preventing means when the automobile door is in an open state and to disable the same when either the first or second switch means is held in an activated state.

Disadvantages:

- It's expensive to use in actual field although it's automotive and quick process.
- It causes weakening of radio recurrence (RF) signals by the organization of sensors dirt.

2.2 Project Title: Vehicle Door Opening Warning System, IEEE IoT Journal, 2019**Objectives:**

The present invention relates to vehicle safety and pre-warning technology and more particularly, to a vehicle door opening warning system, which gives audio and visual warning signals when the car door is being opened, and limits the opening angle of the car door when a sensor at the car door senses the approaching of a car from behind.

Techniques:

Arduino Technology

Image Sensor

Breadboard interfaced with various sensors providing live data feed.

Advantages:

- A first switch means disposed on an exterior side of the automobile door,
- A second switch means disposed on an interior side of the automobile door.

Disadvantages:

- It's expensive to use in actual field although it's automotive and quick process.

- It causes weakening of radio recurrence (RF) signals by the organization of sensors dirt.

2.3 Project Title: Vehicle Door Lock Automation, Springer IoT Conference paper, 2017

Objectives:

The present invention relates generally to a safe remote-control door opening-and-closing device for an automotive vehicle and more specifically to a safety device for a remote control door in which the door will not be opened or closed if a passenger is in an abnormal sitting position within the passenger compartment, or in which the door being closed will be opened again if a passenger is between the door and the vehicle.

Techniques:

Arduino Technology

IR Sensing Technology

Breadboard interfaced with various sensors providing live data feed.

Advantages:

- A door open-and-close mechanism linked to the vehicle door for opening and closing the vehicle door,
- A door open switch connected in series with said driving device for operating said driving device in the first normal direction,

- A door close switch connected in series with said driving device for operating said driving device in the second reverse direction.

Disadvantages:

- Difficult in Large scale Productions.
- Inappropriate value of data is Interpreted in graph analysis.

CHAPTER 3

METHODOLOGY

3.1 DEFINITION IOT BASED VDOWLS SYSTEM

The most typically technology was microwave radar based mostly sensors, that were generally mounted within the rear bumper and observe vehicles that were along with or slightly behind the vehicle.

When a automotive returns whereas someone opens the automotive door, once the unhearable device detects another car from behind, Arduino processor can enable the door management unit to forestall the car door from opening.

Visual warning of light and audio warning of buzzer will be activated. it's activated to produce visual and hearable warning signals when the door is opened and also the highest safety provided is that the door are going to be latched with the assistance of the automotive door Lock mechanism and will not enable the person to open the door whereas the vehicle has been detected.

3.2 COMPONENTS AND MODULES:

In this section, various components and Modules being used for Vehicle door open warning and locking safety system.

- ARDUINO UNO,
- ULTRASONIC SENSOR,
- LOCK ACTUATOR, (V)
- CAR TAIL LIGHT, (V)
- AUDIO BUZZER. (V)

- DC TO AC CONVERTER, (V)
- DOOR CONTROL UNIT, (V)
- BATTERY. (V)

3.2.1 ARDUINO UNO:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. The Arduino uno is a microcontroller board based on the ATmega1280 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The uno is compatible with most shields designed for the Arduino Demilune or Decimole.

The Arduino uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- **VIN.** The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V.** The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3V3.** A 3.3-volt supply generated by the on-board FTDI chip. Maximum current draw is 50 mA.
- **Memory** at The ATmega1280 has 128 KB of flash memory for storing code (of which 4 KB is used for the bootloader), 8 KB of SRAM and 4 KB of EEPROM (which can be read and written with the EEPROM library).
- **Communication** in The Arduino uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega1280 provides four hardware UARTs for TTL (5V) serial communication. An FTDI FT232RL on the board channels one of these over USB and the FTDI drivers (included with the Arduino software) provide a virtual com port to software on the computer. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

- Programming in The Arduino uno can be programmed with the Arduino software (download).
- The ATmega1280 on the Arduino uno comes pre burned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details.

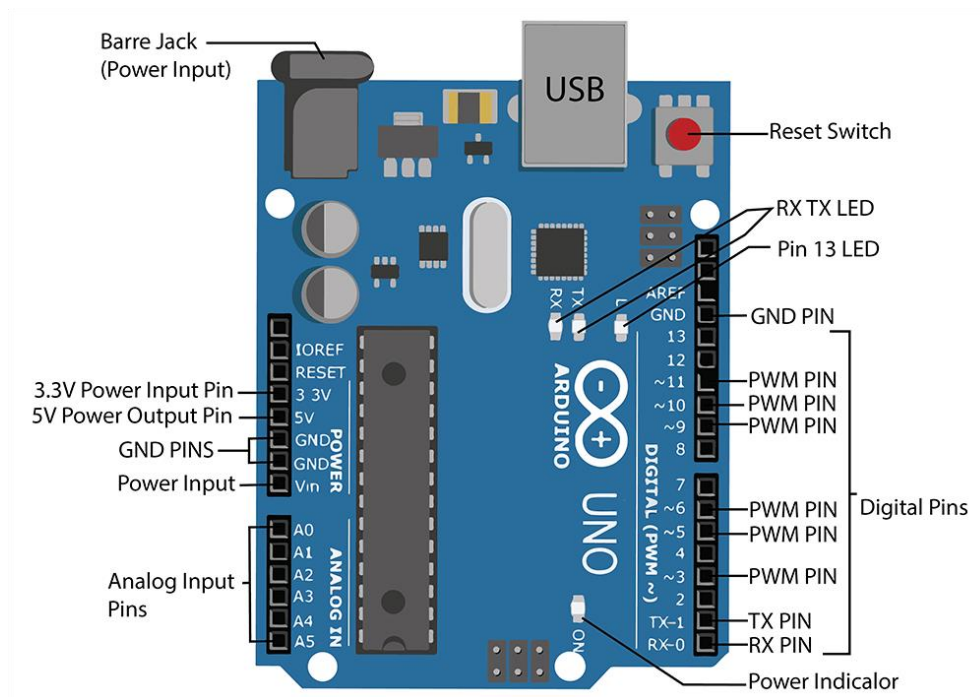


Fig 3.1 Arduino UNO

3.2.2 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).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is $D = \frac{1}{2} T \times C$ (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). For example, if a scientist set up an ultrasonic sensor aimed at a box and it took 0.025 seconds for the sound to bounce back, the distance between the ultrasonic sensor and the box would be about 10.2875 meters.

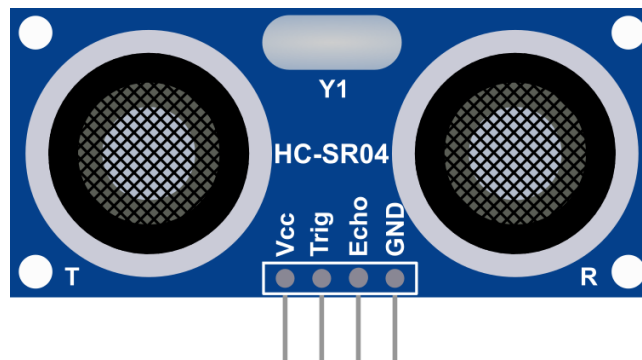


Fig 3.2 Ultrasonic Sensor (HC-SR04)

As shown above the HC-SR04 Ultrasonic (US) sensor is a 4-pin module, whose pin names are VCC, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that,

$$\text{Distance} = \text{Speed} \times \text{Time}$$

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below

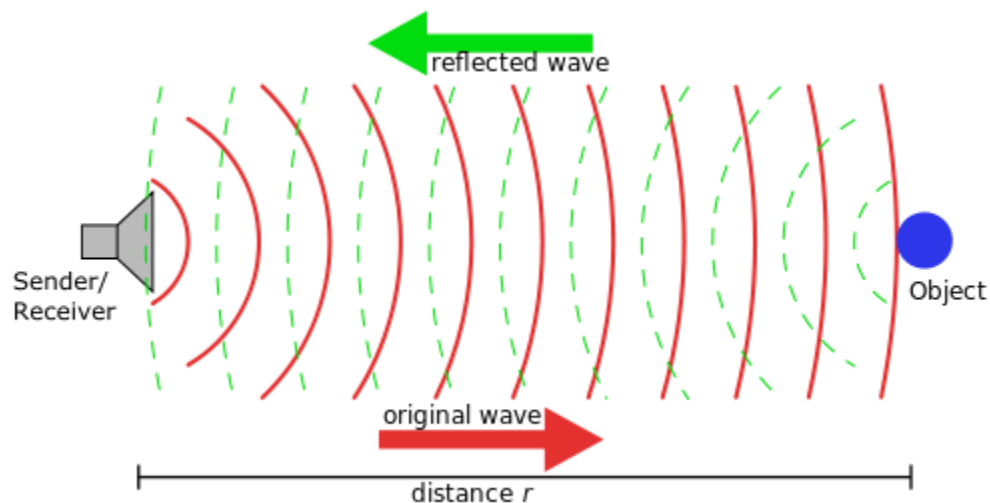


Fig 3.3 Ultrasonic Sensor (T/R)

HC-SR04 distance sensor is commonly used with both microcontroller and microprocessor platforms like Arduino, ARM, PIC, Raspberry Pie etc. The following guide

is universally since it has to be followed irrespective of the type of computational device used.

Power the Sensor using a regulated +5V through the VCC and Ground pins of the sensor. The current consumed by the sensor is less than 15mA and hence can be directly powered by the on board 5V pins (If available). The Trigger and the Echo pins are both I/O pins and hence they can be connected to I/O pins of the microcontroller.

To start the measurement, the trigger pin has to be made high for 10µs and then turned off. This action will trigger an ultrasonic wave at frequency of 40Hz from the transmitter and the receiver will wait for the wave to return. Once the wave is returned after it getting reflected by any object the Echo pin goes high for a particular amount of time which will be equal to the time taken for the wave to return back to the sensor.

The amount of time during which the Echo pin stays high is measured by the MCU/MPU as it gives the information about the time taken for the wave to return back to the Sensor. Using this information, the distance is measured as explained in the above heading.

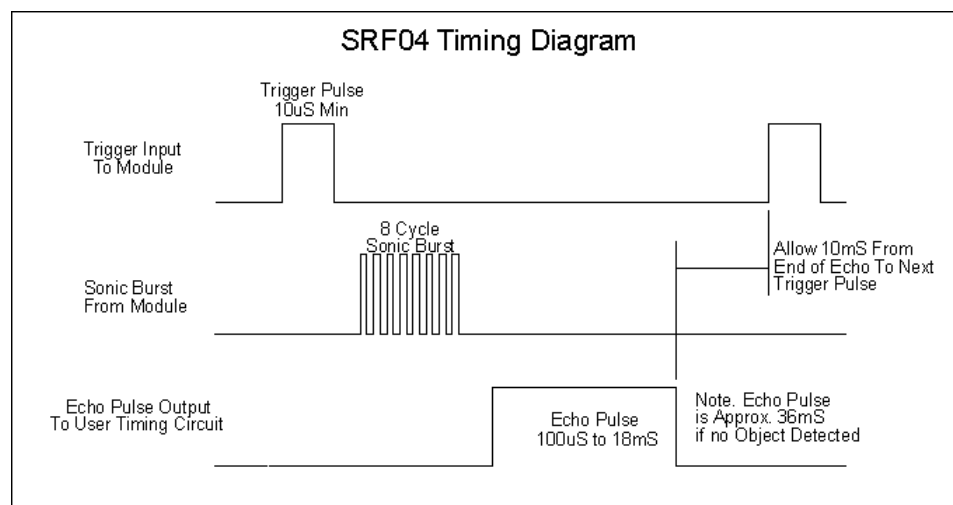


Fig 3.4 Ultrasonic Sensor SRF04 Timing Diagram

There are four pins that you would use to interface with the sensor:

- VCC,
- Trig (signal output pin),
- Echo (signal input pin),
- GND.

Table 1.1 Ultrasonic Sensor Pin Description

Pin Number	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

3.2.3 BREAD BOARD:

Breadboard is equipment that is used for connecting integrated circuits and registers. It helps to test and build circuit connection.

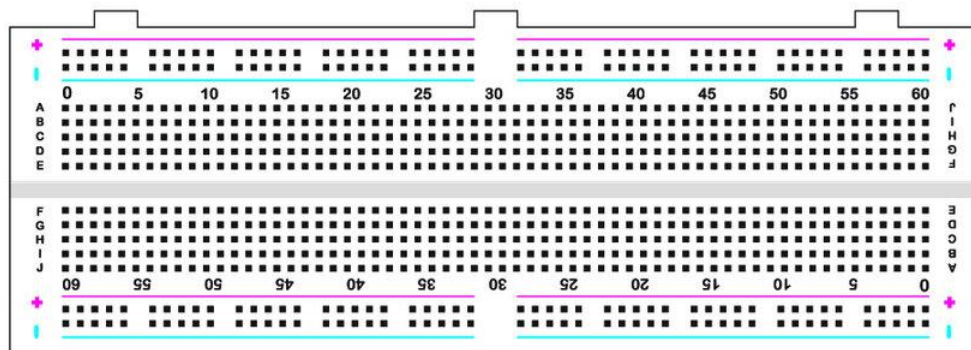


Fig 3.5 Bread Board V2

The breadboard has many holes (horizontal and vertical) into which registers and IC chips are inserted

3.2.4 USB CABLE:

Arduino USB 2 Serial Micro. With the Arduino USB 2 Serial micro get the 5-volt TX and RX lines from a computer USB port that you can connect straight to the Arduino Mini 05 or to other microcontrollers for programming or data communication.

The USB cable connects the Arduino hardware with the power supply mode here in our case we use PC.



Fig 3.6 USB Cable 2.0

3.2.5 CAR DOOR ACTUATOR:

Door lock actuators are an electronic component found on vehicles equipped with power door locks. They are the electronically controlled actuators in every single door that are responsible for locking and unlocking the power door locks when the switches are pressed.

The door lock actuator is a small electric motor. It works with a series of gears. Once engaged, the motor turns spur gears that serve as a gear reduction. The rack and pinion

gears are the last gear set and are connected to the actuator rod. This converts the rotational motion into linear motion which moves the lock.



Fig 3.7 Car Door Lock Actuator

3.2.6 DC TO AC CONVERTER:

A power converter is an electrical or electro-mechanical device for converting electrical energy. A power converter can convert alternating current (AC) into direct current (DC) and vice versa; change the voltage or frequency of the current or do some combination of these.

This inverter converts the DC electricity from sources such as batteries or fuel cells to AC electricity. The electricity can be at any required voltage; in particular it can operate

AC equipment designed for mains operation, or rectified to produce DC at any desired voltage.



Fig 3.8 DC to AC Power Converter

3.3 CIRCUIT DESCRIPTION & WORKING PRINCIPAL:

A car door opening warning system includes a car door opening control unit installed in a car door hinged to a car door frame, and the car hinge comes out of the car door frame. The connecting rod is movable. Regarding the car door, in response to the opening and closing of the car door, the first normally closed contact switch attached to the car door frame and the normally open contact switch attached to the car door frame, and the object proximity sensor is attached To the car door frame. A vehicle door, at least one signal lamp installed on a vehicle door, a vehicle, a doorbell, a relay, a battery, and

a controller, wherein the control unit for opening the vehicle door includes a support frame with a through hole for guiding the vehicle door. The hinge passes through the through hole, and a magnet is installed inside. When the support frame is configured to move from the hinge to the hinge and the piston rod, the stop rod is pivotally connected to the frame bracket and has a free end there.

E or e is assisted by the reciprocating motion of the rod and the free end to move the reciprocating motion of the rod to one of the first positions in which the free end of the stop rod activates one of the first locking portions of the rod. The hinge prevents the car door from opening, the second stop is part of the designated connection to prevent the designated car door from opening, and the second position is the position where the free end of the designated stop is separated from the designated line, that is, open. The cabin can open the door.

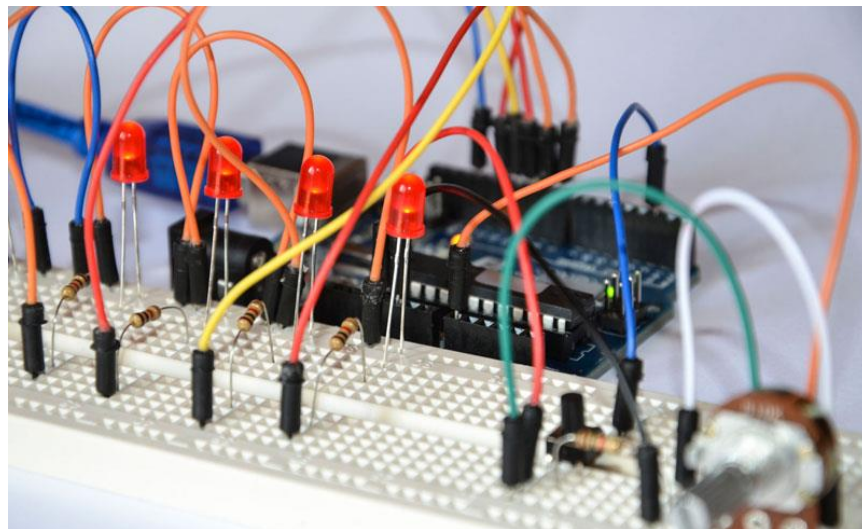


Fig 3.9 VDOWLS Module Test Circuit

When someone opens the cabin door, the pressure from the cabin door will be released to the position connected with the first normally closed contact switch, allowing the energy in the battery to be transmitted to the controller, thereby operating the sensor for detection

And turn on at least one said single warning light for visual warning; when the car door is opened, when the proximity sensor detects the proximity object, the proximity sensor will send a signal to the controller to activate the buzzer to generate Sound the alarm and turn on the relay to operate the magnet, thereby triggering the electromagnetic movement to move the backward translational movement of the rod in the stop rod along the direction of the indicating line to the indicated first position, where the stop rod is engaged with the shown connection of the vehicle.

The door is prevented from opening in the first stop part; after the proximity object passes the proximity object sensor and no signal is detected, the proximity object sensor will stop sending a signal to the controller, and the controller will turn off the relay to turn off the magnetic battery, causing the return to close Translation rod. By lowering the stop rail from the production line to the second position, the car door can be opened. When the car door is opened, when the proximity sensor detects another proximity object, the sensor sends a signal to the controller, which causes the controller to turn on the relay to restart the magnet, which causes the reciprocating rod to raise the stop link. The first lever indicates the position of the second gear used to detect the circuit.

3.4 SOFTWARE REQUIRMENTS:

- Language: C++
- OS: Windows 7 or Higher
- Software: Arduino IDE

3.5 ARCHITECTURE:

The following circuit is the VDOWLS System installed circuit, in this the programmed Arduino UNO has been connected with the DC to AC converter of the vehicle with its modules. The Central Door lock control unit has been connected with the power converter and the tail light and audio system has also been connected.

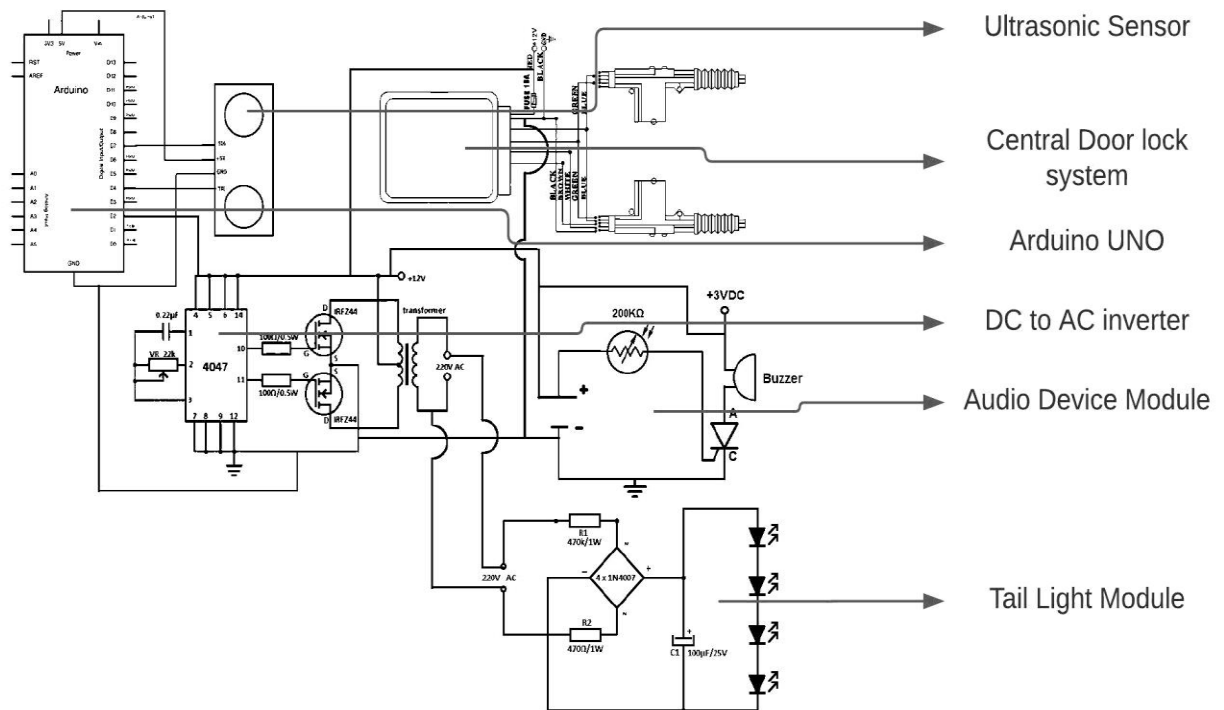


Fig 3.10 VDOWLS System Circuit

3.6 FLOWCHART:

The Arduino microcontroller is connected to the power amplifier system of a car, which will convert the low voltage current (DC) to the required high voltage current (AC). This is done to support the power requirement for the connected modules of a car.

Then the amplified power will be connected to all the modules, now when the door open switch has been triggered the power circuit will get closed and then the microcontroller will be switched on and then the sensor will be powered and will detect the approaching vehicles and sends the signal to the microcontroller, it will decide the control.

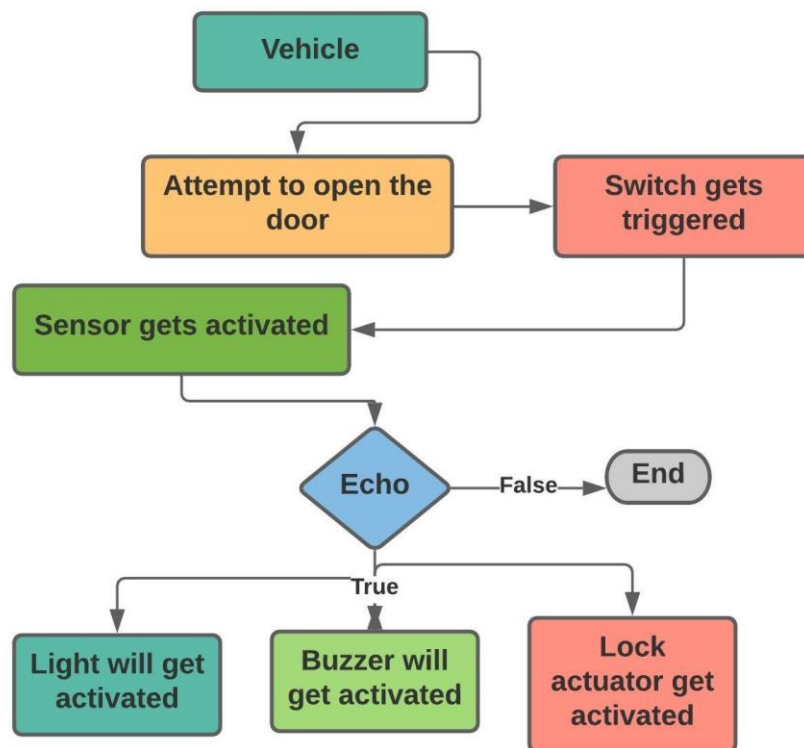


Fig 3.11 VDOWLS System Circuit

CHAPTER 4

RESULTS AND DISCUSSION

A door opening assistant for a motor vehicle is specified. This comprises an environment sensor system for monitoring at least the lateral area of a vehicle, a device for detecting an opening of a vehicle door or the intention of a vehicle occupant to open a door or an already opened door, an evaluation unit for carrying out a situation analysis, wherein it is evaluated whether at least an environment object is located in a danger area to the side of the vehicle or will enter the area within a predetermined time and a warning or a door locking device to prevent the opening of the vehicle door when at least one environment object is in the danger zone or could enter the danger zone.

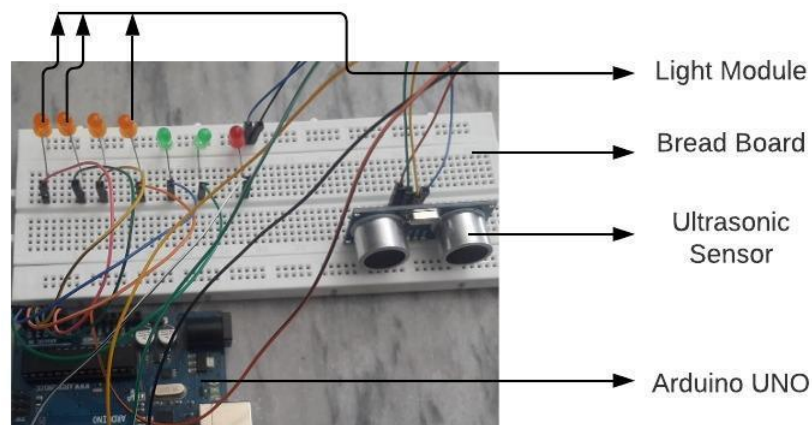


Fig 4.1 VDWLS System Module Circuit

Visual warning of light and audio warning of buzzer will be activated. it's activated to produce visual and hearable warning signals when the door is opened and also the

highest safety provided is that the door are going to be latched with the assistance of the automotive door Lock mechanism and will not enable the person to open the door whereas the vehicle has been detected.

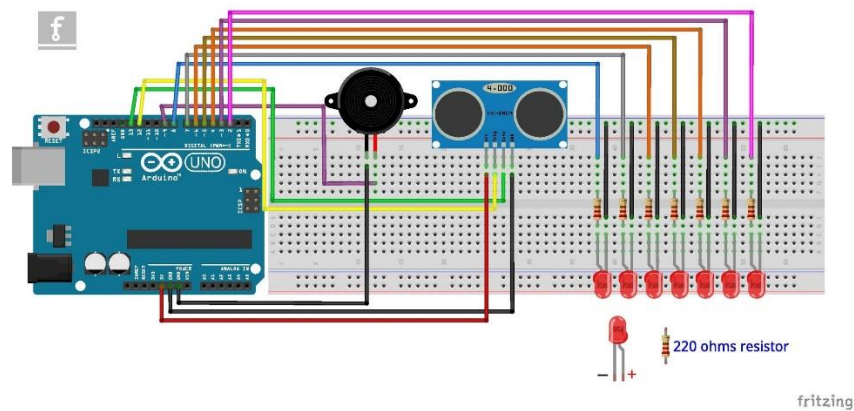


Fig 4.1 Graphical Representation of VDOWLS System Module Circuit

As shown above the HC-SR04 Ultrasonic (US) sensor is a 4-pin module, whose pin names are VCC, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver.

A car door opening warning system includes a car door opening control unit installed in a car door hinged to a car door frame, and the car hinge comes out of the car door frame. The connecting rod is movable. Regarding the car door, in response to the opening and closing of the car door, the first normally closed contact switch attached to the car door frame and the normally open contact switch attached to the car door frame, and the object proximity sensor is attached To the car door frame.

A vehicle door, at least one signal lamp installed on a vehicle door, a vehicle, a doorbell, a relay, a battery, and a controller, wherein the control unit for opening the vehicle door includes a support frame with a through hole for guiding the vehicle door.

The hinge passes through the through hole, and a magnet is installed inside. When the support frame is configured to move from the hinge to the hinge and the piston rod, the stop rod is pivotally connected to the frame bracket and has a free end there.

CHAPTER 5

CONCLUSION AND FURTHER ENHANCEMENT

The experimental results illustrate that the proposed Vehicle Door Open Warning and Locking System can provide high vehicle detection accuracy and give warning to driver effectively for driver assistance and collision warning.

This active safety technology will provide a safety to the vehicle and the appearing vehicle from collision and will reduce the accidents caused by these kinds of unexpected activities at the highest rate.

The present invention has been accomplished under the circumstances in view. It is one object of the present invention to provide a vehicle door opening warning system, which gives audio and visual warning signals when the car door is being opened. It is another object of the present invention to provide a vehicle door opening warning system, which limits the opening angle of the car door when a sensor at the car door senses the approaching of a car from behind.

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APPENDIX

A. SOURCE CODE:

```
int const trigPin = 10;

int const echoPin = 9;

int const buzzPin = 2;

int const ledPin = 4;

int const actPin = 5;


void setup()
{
    pinMode(trigPin, OUTPUT);

    pinMode(echoPin, INPUT);

    pinMode(buzzPin, OUTPUT);

    pinMode(ledPin, OUTPUT);

    pinMode(actPin, OUTPUT);

}

void loop()
{
    // Duration - input pulse width, distance - distance to the obstacle

    int duration, distance;
```

```

    digitalWrite(trigPin, HIGH); //high - 1

    delay(1); // time deley in ms

    digitalWrite(trigPin, LOW); //low - 0


    duration = pulseIn(echoPin, HIGH);

    distance = (duration/2) / 29.1; //amount of sound travels in 1 min = 29.1ms

    if (distance <= 50 && distance >= 0) {
        digitalWrite(buzzPin, HIGH);
        digitalWrite(ledPin, HIGH);
        digitalWrite(actPin, HIGH);
    } else
    {
        digitalWrite(buzzPin, LOW);
        digitalWrite(ledPin, LOW);
        digitalWrite(actPin, LOW);

    }
    delay(5);
}

```

B. SCREENSHOTS AND OUTPUT:

System Code Execution:

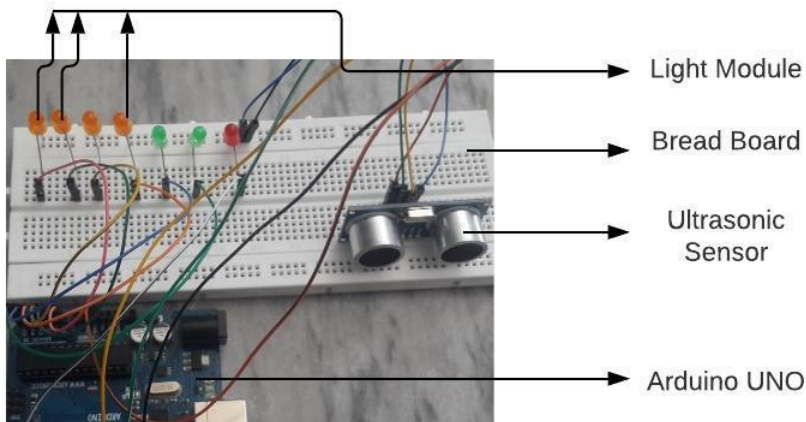
```
Project_system_program | Arduino 1.8.13
File Edit Sketch Tools Help

Project_system_program

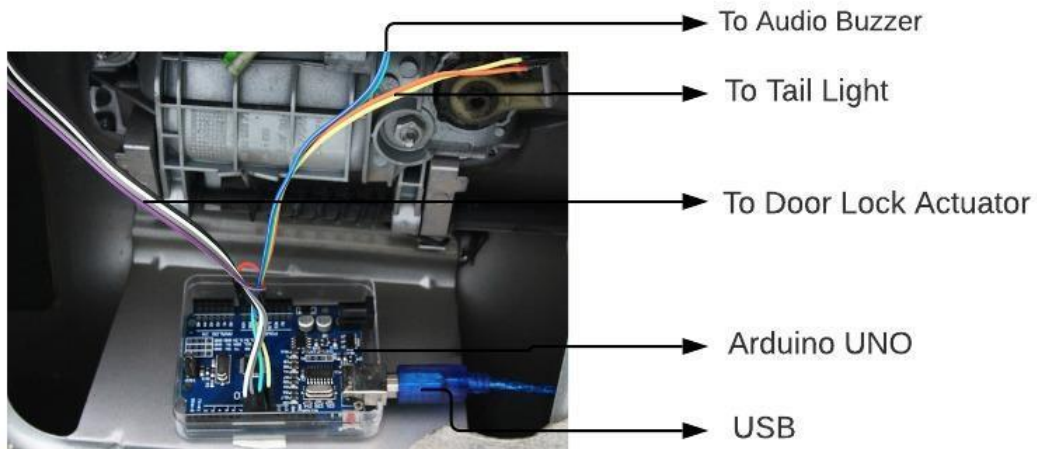
1
2 int const trigPin = 10;
3 int const echoPin = 9;
4 int const buzzPin = 2;
5 int const ledPin = 4;
6 int const actPin = 5;
7
8 void setup()
9 {
10  pinMode(trigPin, OUTPUT);
11  pinMode(echoPin, INPUT);
12  pinMode(buzzPin, OUTPUT);
13  pinMode(ledPin, OUTPUT);
14  pinMode(actPin, OUTPUT);
15 }
16
17 void loop()
18 {
19  // Duration - input pulse width, distance - distance to the obstacle
20  int duration, distance;
21
22  digitalWrite(trigPin, HIGH); //high - 1
23  delay(1); // time delay in ms
24  digitalWrite(trigPin, LOW); //low - 0
25
26  duration = pulseIn(echoPin, HIGH);
27  distance = (duration/2) / 29.1; //amount of sound travels in 1 min = 29.1ms
28  if (distance <= 50 && distance >= 0) {
29      digitalWrite(buzzPin, HIGH);
30      digitalWrite(ledPin, HIGH);
31      digitalWrite(actPin, HIGH);
32  } else
33  {
34      digitalWrite(buzzPin, LOW);
35      digitalWrite(ledPin, LOW);
36      digitalWrite(actPin, LOW);
37  }
38 }
39
Done compiling.

Sketch uses 1968 bytes (6%) of program storage space. Maximum is 32256 bytes.
Global variables use 9 bytes (0%) of dynamic memory, leaving 2035 bytes for local variables. Maximum is 2048 bytes.
```

System Test Module:



Installed System in a Vehicle:





DC to AC converter

Connected Output
wires to reley



Ultrasonic
Sensor Installed
on vehicle

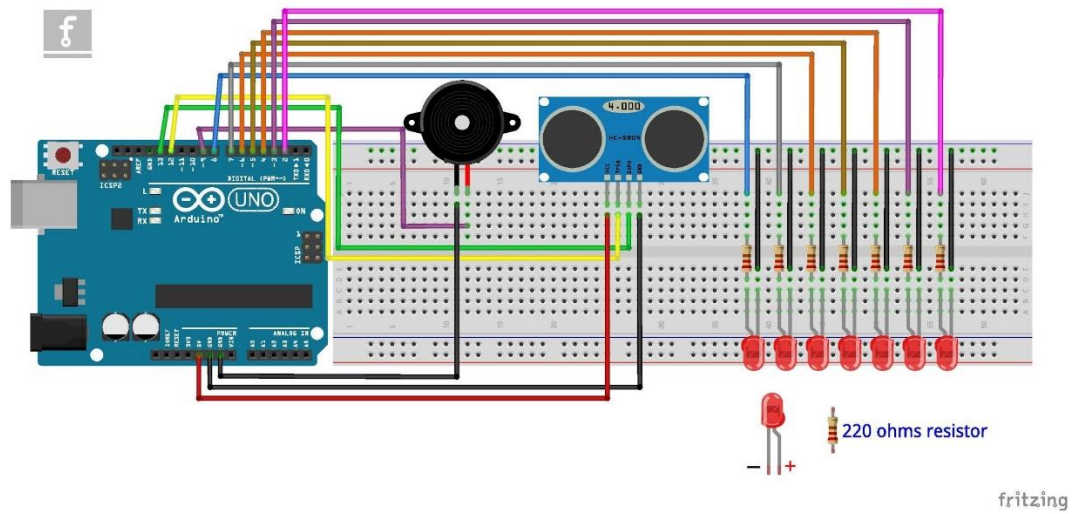
On Door Opened



On Door Closed



Graphical Circuit Connection of a Test Module:



C. PUBLICATION WITH PLAGARISM REPORT:

Arduino Uno, Ultrasonic Sensor HC-SR04 Vehicle Door Open Warning and Locking Safety System

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Abstract - A vehicle door open warning and locking safety system have been introduced to solve the problem of vehicle target collisions that appeared earlier when the driver and passenger. The car door opening alert system includes signal detectors for detection. When a car returns while someone opens the car door, when the Ultrasonic sensor detects another car from behind, Arduino processor will allow the car door control unit to prevent the car door from opening. Visual warning of light and Audio warning of buzzer will be activated. It is activated to provide visual and audible warning signals when the car door is opened and the highest safety provided is the door will be locked with the help of the car door Lock Actuator and will not allow the person to open the door while the vehicle has been detected.

Keywords: Arduino UNO; Ultrasonic Sensor, Lock Actuator, Light, Buzzer.

I. INTRODUCTION

Due to the rapid development of technology and user interest in driving safety, vehicle safety technology is becoming increasingly popular. Due to the high incidence of motor vehicle accidents in recent years, driving safety is one of the hottest and the most worrying. The support system has the potential to improve the quality of road transportation and reduce driving entertainment. In the future, driving assistance will play an important role in protecting drivers and passengers and preventing accidents. The World Health Organization reports that more than 120 million people die each year in road accidents, and recently 5 billion people have disabilities. For many years, little attention was paid to the area behind the vehicle before opening the doors leading to oncoming vehicles, including oncoming vehicles and bicycles. This resulted in primary and secondary damage to the front-wheel drive driver, which accounted for 11.6% of the total number of people

with disabilities, delayed access to the lane and leads to falls, with 5.3% of all deaths. Work Technology that can prevent these accidents. Scientists and experts use vision and radar technology to determine the purpose of entering the warning zone behind the car.

II. LITERATURE SURVEY

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III. PROPOSED SYSTEM

The most typically technology was microwave radar based mostly sensors, that were generally mounted within the rear bumper and observe vehicles that were along with or slightly behind the vehicle.

When a automotive returns whereas someone opens the automotive door, once the un hearable device detects another car from behind, Arduino processor can enable the door management unit to forestall the car door from opening. Visual warning of light and audio waming of buzzer will be activated. it's activated to produce visual and hearable warning signals when the door is opened and also the highest safety provided is that the door are going to be

latched with the assistance of the automotive door Lock mechanism and will not enable the person to open the door whereas the vehicle has been detected.

IV. SYSTEM ARCHITECTURE

Modules

- Arduino UNO
- Ultrasonic Sensor
- Lock Actuator
- Light
- Buzzer

1. Arduino UNO:

The Arduino Uno is associate ASCII text file microcontroller board supported the microchip Mega328P microcontroller and developed by Arduino. The board is supplied with sets of digital and analog input/output (I/O) which will be interfaced to varied enlargement boards' (shields) and alternative circuits. The board has fourteen digital I/O pins (six capable of PW output), half-dozen analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a kind B USB cable.



Fig. 1. Arduino UNO microcontroller.

It may be supercharged by the USB cable or by an external 9-volt battery, tho' it accepts voltages between seven and twenty volts. It is also the same as the Arduino Nano and Leonardo. an honest example of the Arduino Uno microcontroller is shown within the figure 1. The word "Uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference

versions of Arduino, which have now evolved to newer releases.

The Mega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer. While the Uno communicates using the original STK500 protocol, it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Mega8U2 programmed as a USB-to-serial converter. Arduino Uno microcontroller is full set containing the memory and the I/O serial ports which are used in interfacing it with other devices like LCD, LEDs, Buzzer and many others.

Once the program is made in the computer, it is transferred to the Arduino chip using the USB cable. The circuit to be interfaced with the microcontroller is connected to it. Arduino Uno in the circuit controls all the functioning of the attached device and make them operate as per the program. Arduino microcontroller has been used by several researchers to interface the devices in motion detector with LEDs, Buzzers and LCD.

II. Ultrasonic Sensor HC-SR04:

The HC-SR04 ultrasonic sensor makes use of SONAR to decide the space of an item similar to the bats do. It gives amazing non-contact variety detection with excessive accuracy and strong readings in an easy-to-use package deal from 2 cm to four hundred cm or 1" to thirteen feet.



Fig. 2. Ultrasonic Sensor

The operation isn't always stricken by daylight or black material, even though acoustically, tender substances like fabric can be tough to detect. It comes whole with ultrasonic transmitter and receiver module. The ultrasonic sensor makes use of the mirrored image of sound in acquiring the time among the wave dispatched and the wave received.

It normally dispatched a wave on the transmission terminal and come up of the meditated waves.

The time taken is used collectively with the regular pace of sound in air (340ms-1) to decide the house among the sensing element and therefore the obstacle. The un hearable sensor has been utilized by various researchers to feel the actions of the gadgets as they technique it.

III. Car Door Lock Actuator:

In a door lockup equipment together with a locking mechanism movable between barred and unsecured positions, manually reversible power operated drive means that connected to same locking mechanism for moving it between said locked and unlocked positions, non-yielding manual means connected to said lock mechanism for moving it between said locked and unlocked positions, said power operated drive means being caused to reverse whenever said manual means is employed to lock or unlock said lock mechanism, the development that comprises.



Fig. 3. Car Door Lock Actuator

The system will activate the mechanism by causation electrical signal to the facility module of the automobile which can amplify low voltage DC current to AC current which can be fed into the central door lock system.

IV. System Circuit Wiring:

The Arduino microcontroller is connected to the power amplifier system of a car, which will convert the low voltage current (DC) to the required high

voltage current (AC). This is done to support the power requirement for the connected modules of a car.

Then the amplified power will be connected to all the modules, now when the door open switch has been triggered the power circuit will get closed and then the microcontroller will switched on and then the sensor will powered and will detect the approaching vehicles and sends the signal to the microcontroller, it will decide the control.

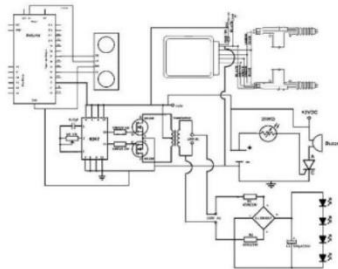


Fig. 4. Safety System Circuit Diagram

V. System Work Flow:

The below mentioned figure describes the work flow of the system which was implemented on a car as a safety device.

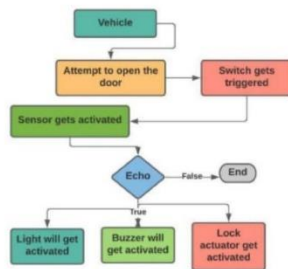


Fig. 5. System workflow chart

V. SUMMARY AND CONCLUSION

The experimental results illustrate that the proposed Vehicle Door Open Warning and Locking System can provide high vehicle detection accuracy and give warning to driver effectively for driver assistance and collision warning.

This active safety technology will provide a safety to the vehicle and the appearing vehicle from collision and will reduce the accidents caused by these kinds of unexpected activities at the highest rate.

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