DESIGN AND PERFORMANCE TEST OF AUTO BRAKING SYSTEM USING ULTRASONIC SENSOR

Course Title: Project and Thesis

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Submitted for the partial fulfillment
A Thesis
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Declaration

We hereby, declare that the work presented in this project is the outcome of the investigation and research work performed by us under the supervision of **Md. Navid Inan, Lecturer, Department of Mechanical Engineering, Sonargaon University (SU).** We also declare that no part of this project and thereof has been or is being submitted elsewhere for the award of any degree.

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Approval

This is to certify that the project on ***"Design and performance Test of Auto Braking System Using Ultrasonic Sensor"*** by Md.Mubarak Hossain ID:BME2001020254, Md.Shoriful Islam-ID:BME:2001020600, Md. Ashikur Rahman - ID:BME2001020221, Md.Mostafizur Rahman -ID: BME2001020316, Md.Sohel Rana- ID:BME2001020320, has been carried out under our supervisor. The project has been carried out in partial fulfillment of the requirement for the degree of Bachelor of Science (BSc) in Mechanical Engineering of the year 2023 and has been approved as to its style and contents.

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ABSTRACT

Recent years have seen a surge in purchasing of automobiles and with this increase in the number of automobiles have resulted in a considerable increase in accident rates. According to the Road Safety Organization, the number of road crashes and deaths last year were 27.14 percent and 22.74 percent higher than that of the previous year. On an average, 25 accidents take place every day in our country. Most of the accidents occur due to the delay of the driver to hit the brake. The control on the speed of vehicles can play a vital role in the reduction of number of accidents which can be achieved by the Auto Braking System (ABS). The main purpose of present Automobiles is being developed by more of electrical parts for efficient operation. The braking system was designed and applied on a car to make the driving process safety using embedded system design. So, in this project work braking system is developed such that when it is active it can apply brake depending upon the object sensed by the ultrasonic sensor. The ultrasonic sensor receives the reflected ultrasonic signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle and speed of vehicle. The microcontroller is used to control the braking of the vehicle based on the detection pulse information and apply brake to the car for safety purpose. A prototype was created and the structural analysis of the prototype was performed.

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INTRODUCTION

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INTRODUCTION

1.1 Introduction:

Braking systems of vehicles were always specified as the highest important factor concerning safety matters. The number of automobile users is increasing day by day. At the Same time, traffic congestion has become a worldwide problem. This problem is mainly due to human driving which involve reaction time delays and judgment errors that may affect traffic flow and cause accidents. The traditional medium used for brake system (compressed air) can be now controlled with the speed and precision offered by modern electronic abilities. Auto Braking System (ABS) introduced in commercial vehicles providing rapid brake response and release for every single wheel therefore ensuring safety. The extremely rapid response time provided by the electronic control can be used for crucially shortening the braking distance by introducing advanced control of braking system operation. Such a complex task imposed to the control of braking system cannot be based on the driver abilities and need to be done independently of the driver.

Automatic braking is a safety technology that automatically activates the vehicle's brake system, to some degree, when necessary. Systems vary from pre-charging brakes, to slowing the vehicle to lessen damage. Some advanced systems completely take over and stop the vehicle before a collision occurs. It is critical that drivers understand the exact capabilities of their car's automatic braking system. Regardless of a vehicle's autonomous technologies, drivers should remain aware of their surroundings and maintain control at all times. The Insurance Institute for Highway Safety points out that automatic braking or brake assist is an integral component of crash avoidance technologies, including front crash prevention systems, back over prevention systems, and cross-traffic alert systems. Each automaker may have a different name for such technologies, but the bottom line is that the brake assist is meant to minimize accidents.

An improved ABS braking forces management would certainly enable to reach the given task. The advanced strategy for the braking force management, proposed here, is based on intelligent controlling of the braking forces which will continuously keep the track of the distance between the two vehicles. When two come dangerously close the microprocessor in the system activates the brakes and it will stop the vehicle. Intelligent braking system has a lot of potential applications especially in developed countries where research on smart vehicle and intelligent

highway are receiving ample attention. The system when integrated with other subsystems like automatic traction control system, intelligent throttle system, and auto cruise system, etc. will result in smart vehicle maneuver. The driver at the end of the day will become the passenger, safety accorded the highest priority and the journey will be optimized in term of time duration, cost, efficiency and comfort ability. The impact of such design and development will cater for the need of contemporary society that aspires quality drive as well as to accommodate the advancement of technology especially in the area of smart sensor and actuator. The emergence of digital signal processor enhances the capacity and features of universal microcontroller. The overall system is designed so that the value of inter-vehicle distance from infrared laser sensor and speed of follower car from speedometer are fed into the DSP for processing, resulting in the DSP issuing commands to actuator to function appropriately [1]. The most popular systems like Antilock Braking Systems (ABS), Traction Control and Stability Control employ different types of sensors to constantly monitor the conditions of the vehicle, and respond in an emergency situation.

An intelligent mechatronic system includes an ultrasonic wave emitter provided on the front portion of a car producing and emitting ultrasonic waves frontward in a predetermined distance. An ultrasonic receiver is also placed on the front portion of the car operatively receiving a reflective ultrasonic wave signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle. Then a microcontroller is used to control the speed of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose [2].

1.2 Objective of the Project:

As the requirements of human beings for comfort and safe driving increases, Auto Braking system is addition in regular safety system, and also increase demand of vehicle in market view. Mainly it is used when drive the vehicles in day and night time. Mostly the accident occurred in the night time due to long travel the driver may get tired. So, the driver may hit the front side vehicle or road side trees.

- To study or learn more about automatic braking system
- To design the automatic braking system in order to avoid the accident
- To develop a safety vehicle braking system using ultrasonic sensor and to design a vehicle with less human attention to the driving.

- To avoid critical damage of vehicle during driving. Most of the time driver is unable to judge proper distance between car and an obstacle, so this system will be helpful as well as important in car safety.

CHAPTER 2

LITERATURE REVIEW

CHAPTER 2

LITERATURE REVIEW

2.1 Literature Review:

Visiting numbers of workshops like ACE Workshop, Gazi Group, Navana Ltd. Iran Motor, going through detailed study of the ABS from various sources such as books, internet and carefully understanding mounting of each components of ABS such as ECM, Hydraulic control module warning system got clear idea about the existing advance braking technologies. Workshop technicians got mixed feedback from owners of vehicles with ABS. Drivers reported that they find stopping distance for regular conditions are lengthened by ABS either because there may be errors in the system or because of clinking or noise of ABS may contribute to drivers not braking at same rate.

Hence concluded that braking system present on vehicle are either so advance that they take the braking control away from driver and increase the risk factor or some of them are not that much advance to perform precisely, so we decided to make such system which can allow the driver brakes manually at the same time system also controlling the brakes to reduce risk factors in panic situation. An ABS can be expensive to maintain. Expensive sensors on each wheel can cost hundreds of dollars to fix if they get out of calibration or develop other problems.

For some, this is a big reason to decline an ABS in a vehicle. Moreover, many commuter vehicles in India don't have the option of ABS because it's very expensive. It's easy to cause a problem in an ABS by messing around with the brakes. Problems include disorientation of the ABS, where a compensating brake sensor causes the vehicle to shudder, make loud noise or generally brake worse. ABS can only help if the rider applies it in the right time manually and maintains the distance calculations. ABS has its own braking distance. Volvo's laser assisted braking could not work effectively in rainfall and snowfall season and laser is easily affected by atmospheric conditions.

In our project we are using Ultrasonic sensors and Microcontroller with which the speed of the vehicle is automatically reduced and voice alarms are given to the user when it approaches an object by automatically sensing the position of the object vehicle.

CHAPTER 3

WORKING PRINCIPLE

CHAPTER 3

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3.1 Block Diagram:

This is main block diagram of automatic braking system project. The Power supply is very important part of the project. This unit provided the sufficient current and voltage to others unit Reset switch are connected with microcontroller RESET pin when microcontroller face any aquand situation by this time if you press the RESET button than microcontroller will be reset.

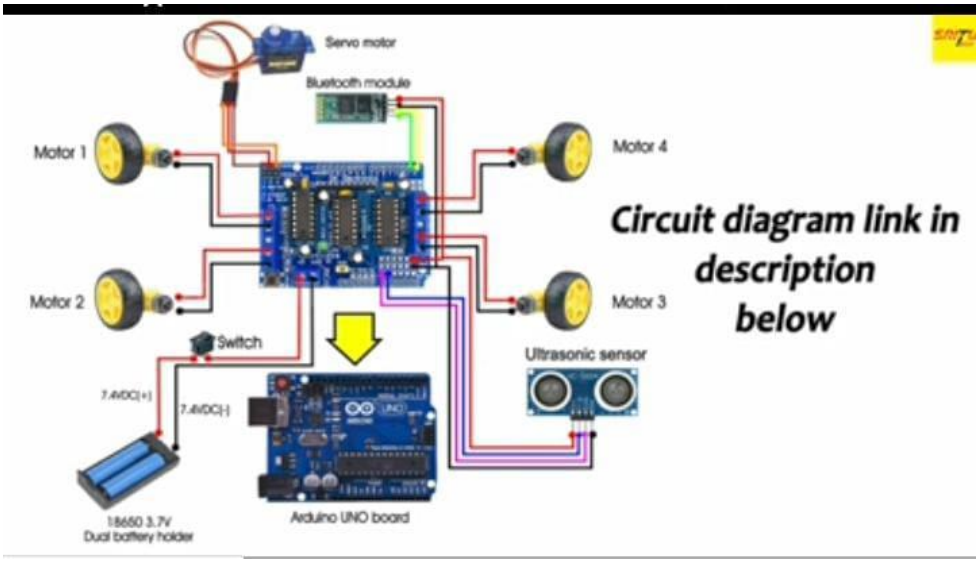


Fig 3.1: Block Diagram-1

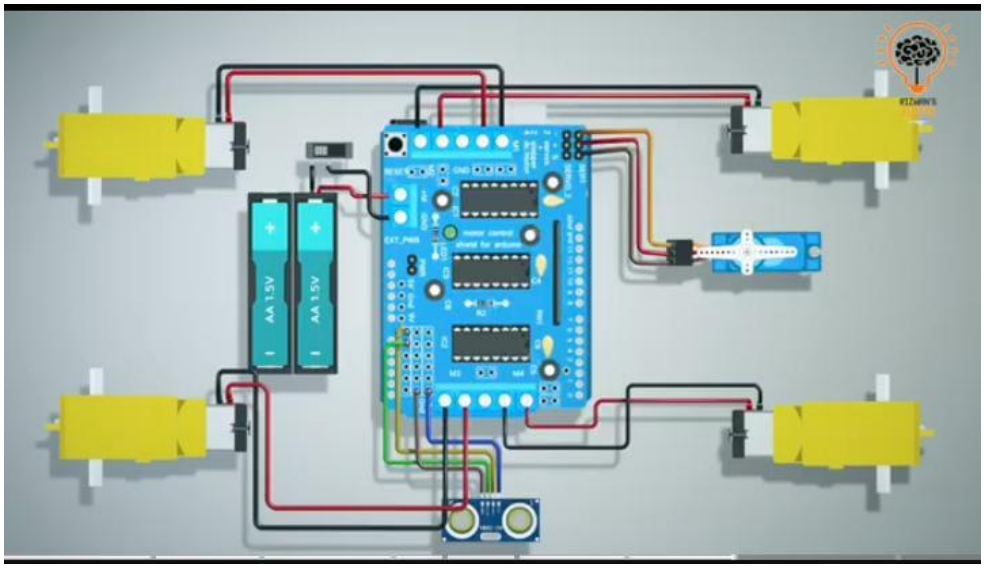


Fig 3.1: Block Diagram-2

Highway switch you can select the highway mode and jam mode switch you can select the jam mode. L293d driver module drive the 4-gear motor. Buzzer sounder generate the warning sound for driver.

3.2 Circuit Diagram:

To ensure proper vehicle control during braking and reduce stopping distance, most vehicles have ABS on board to increase the safety of passengers. Based on different sensor input signals, the precise control of the hydraulic modulator ensures that each wheel has the right braking force at the right time. The fault statuses are monitored by the control unit and displayed to the driver. The electric park brake option further enhances vehicle safety and driver comfort.

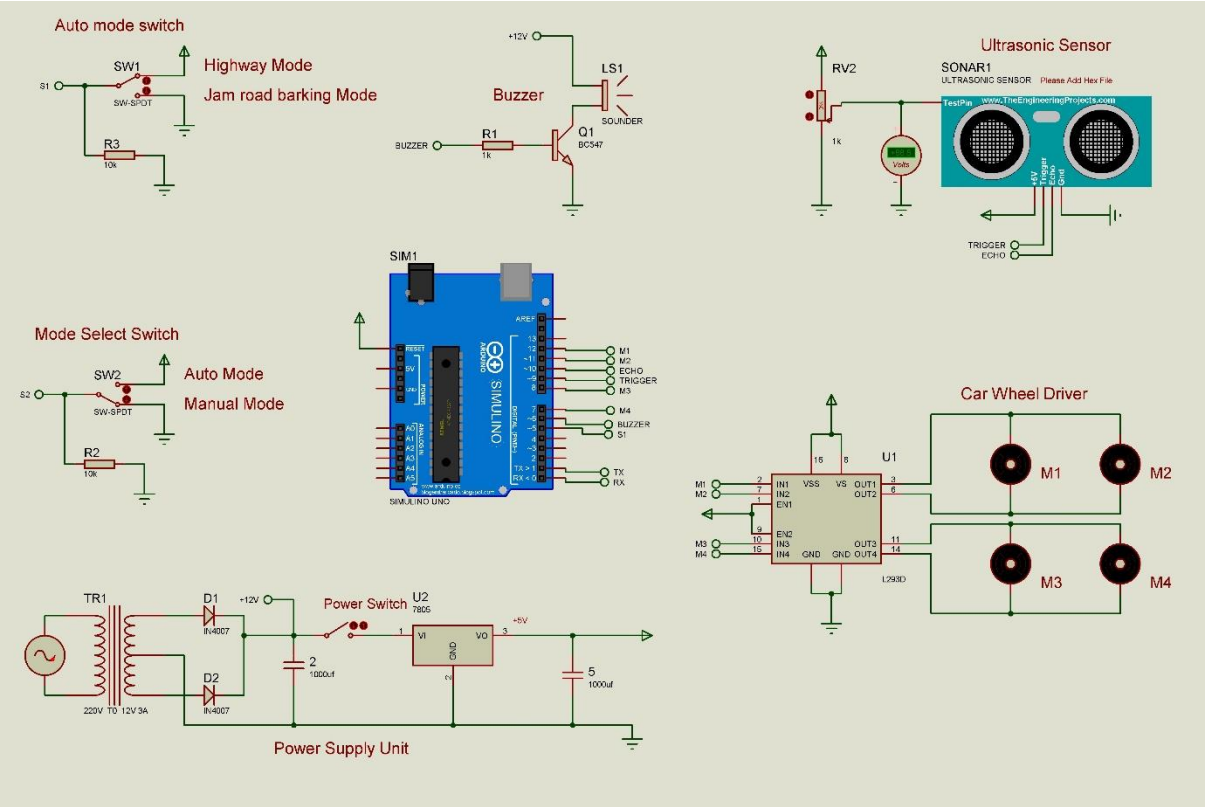


Fig 3.2: Circuit Diagram

3.3 Working Principle:

For power up our system we have made a different power circuit. At first, we used a 220V to 12V transformer to stem down the voltage into the 12V. Then we used a rectifier and capacitor to convert AC voltage into the DC voltage and filter the signal. Then we used buck converter to supply fix 12V DC in our system. If we used a direct 12V battery to supply power then we don't need these extra arrangements in our system. Now we will go to our control circuit and into our main system. At first to start the system we need to press the pushbutton as start switch. When the button is pressed once than all the sensors, buzzers, led will start to operate.

An ultrasonic receiver is also placed on the front portion of the car operatively receiving a reflective ultrasonic wave signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle and speed control of vehicle.
The microcontroller is used to control the braking of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose. It has two functional switch one is select the two-option manual and auto and another switch is that jam mode or HI way mode.

This car has two speed hi-speed and low speed or stop position. Vehicle speed depend on ultrasonic sensor. In our sensors we have added 2 sensors. One is eye blink sensor and other is ultrasonic sensor. Eye blink sensor is digital sensor. It will generate a digital signal and will give input to our controller. When our eyes are open, the sensor will continuously send low signal that means "0" to our microcontroller and the eyes are open. When the eyes are closed the signals is set to high or sends "1" signals to our microcontroller. When the microcontroller will receive the high signal, it will turn on the RED led and the buzzer and automatically and stop the operation of L293D.

3. 4 Using Device List:

• 220V to 12V Transformer
• Full bridge Rectifier
• 1000uF Capacitor
• Buck Converter LM 2596
• 12V Battery
• Buzzer
• LCD Display with I2C Module
• LED

3.4.1 Arduino Uno:

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Adriano boards are able to read inputs – light on a sensor, a finger on a button, or a Twitter message – and turn it into an output – activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language and the Arduino Software (IDE), based on Processing.

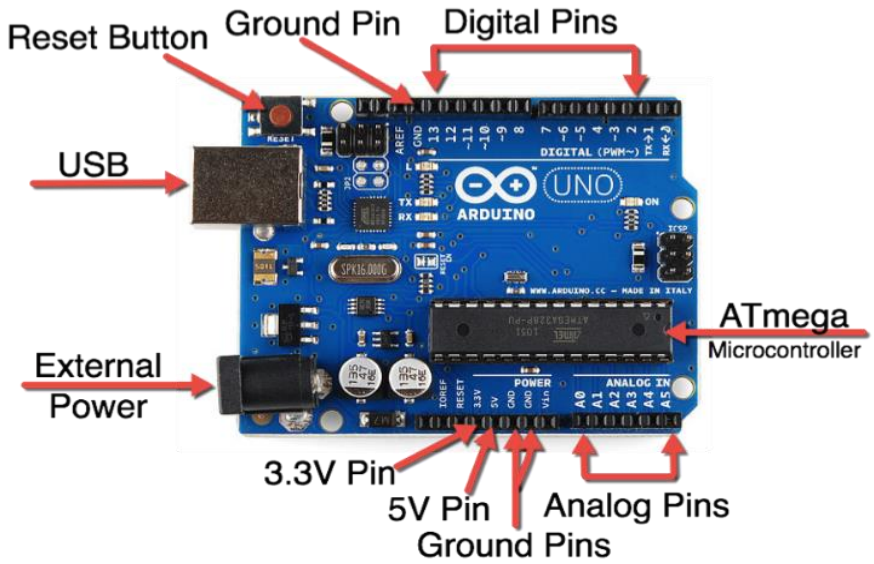


Fig: 3.3.1.1 Arduino UNO Pin Diagram

3.4.2 Technical specifications:

Microcontroller	Atmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (Atmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (Atmega328P)
EEPROM	1 KB (Atmega328P)

The Atmega328 is a single chip micro-controller created by Atmel and belongs to the mega AVR series. Today the Atmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models. Key features of this device are as below.

- 28-pin AVR Microcontroller
- Flash Program Memory: 32 k bytes
- EEPROM Data Memory: 1 k bytes
- SRAM Data Memory: 2 k bytes
- I/O Pins: 23
- Timers: Two 8-bit / One 16-bit
- A/D Converter: 10-bit Six Channel
- PWM: Six Channels
- RTC: Yes, with Separate Oscillator
- MSSP: SPI and I²C Master and Slave Support
- USART: Yes
- External Oscillator: up to 20MHz

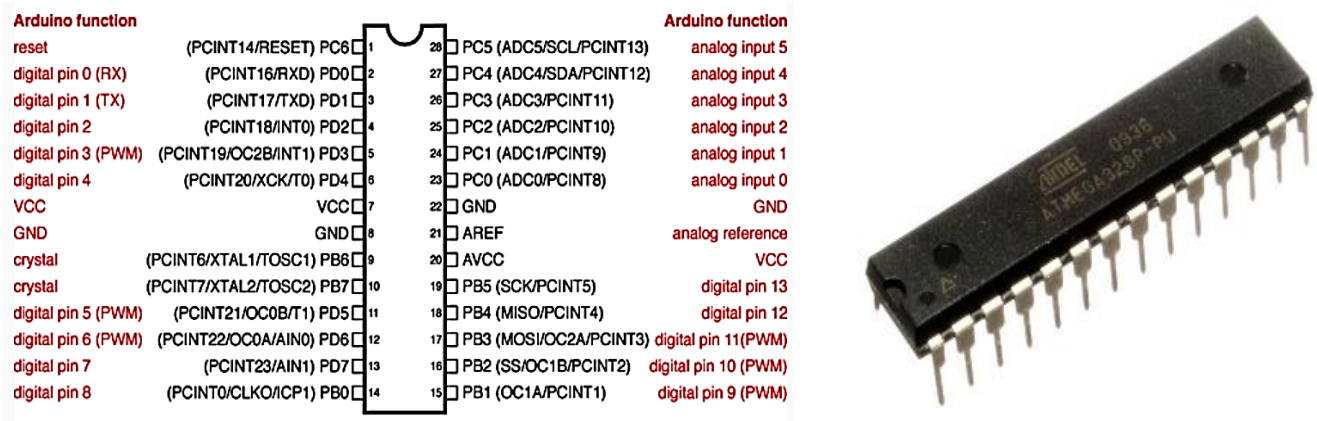


Fig: 3.3.2.1: ATMEGA328P-PU chip to Arduino Pin Mapping

3.4.3 Motor Driver (L293D)

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

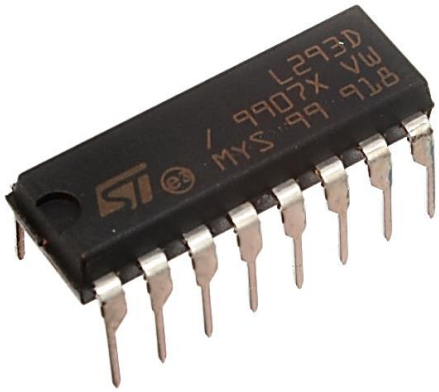


Fig: 3.3.3.1 L293D Motor Driver

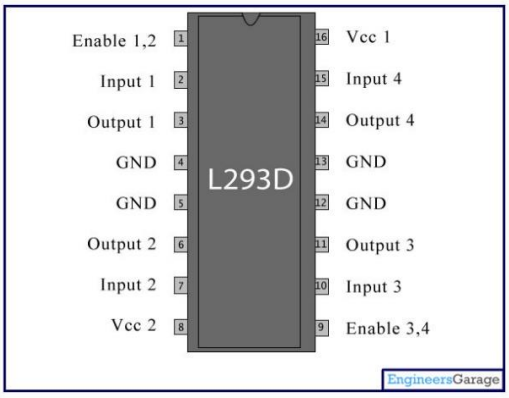


Fig: 3.3.3.2 L293D Pin Diagram

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively. Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs.

Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

3.4.4 DC Geared Motor (wheel motor):

This is a DC motor and wheel set for making robots. These motors are light weight, high torque and low RPM. They can climb hills and have excellent traction, plus you can mount the wheel on either side of the motor with its double-sided output shaft

Fig: 3.3.4.1: DC Geared Motor with wheel

3.4.5 Specifications:

- Motor Voltage: 3 – 12 V
- Motor Current: 70 mA (typical) – 250 mA (max)
- Speed: up to 170 RPM
- Torque: up to 0.8 Kg
- Gear Ration: 1:48
- Wheel Diameter: 66 mm
- Wheel Width: 27 mm

3.4.6 Transformer:

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Commonly, transformers are used to increase or decrease the voltages of alternating current in electric power applications.

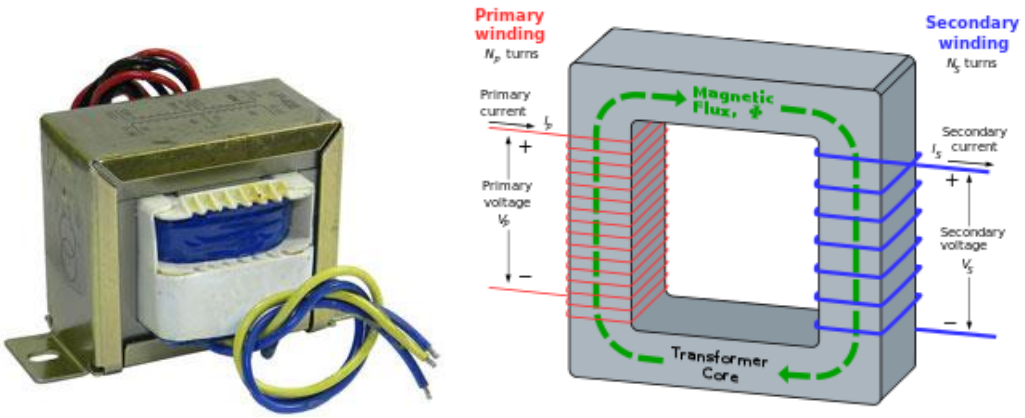


Fig. 3.3.5.1: Transformer

According to Faraday's law of induction, since the same magnetic flux passes through both the primary and secondary windings in an ideal transformer, a voltage is induced in each winding,

3.4.7 LM7805 (Voltage Regulator IC):

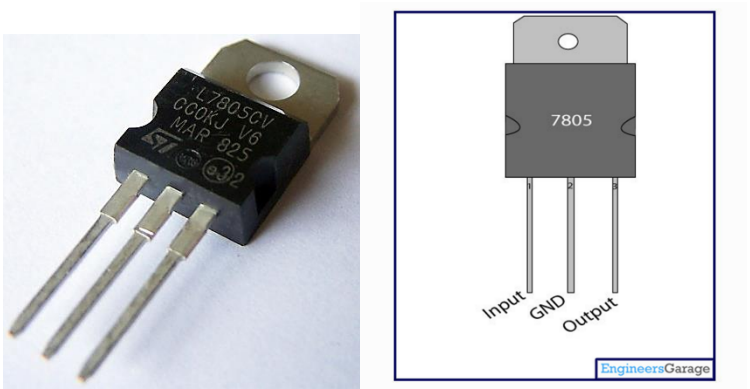


Fig: 3.3.6.1: 7805 (Voltage Regulator IC)

7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator Ics. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

Pin No	Function	Name
1	Input voltage (5V-18V)	Input
2	Ground (0V)	Ground
3	Regulated output; 5V (4.8V-5.2V)	Output

3.4.8 Crystal:

A crystal or crystalline solid is a solid material whose constituent atoms, molecules, or ions are arranged in an ordered pattern extending in all three spatial dimensions. In addition to their microscopic structure, large crystals are usually identifiable by their macroscopic geometrical shape, consisting of flat faces with specific, characteristic orientations.

Fig: 3.3.7.1 Crystal

The scientific definition of a “crystal” is based on the microscopic arrangement of atoms inside it, called the crystal structure. A crystal is a solid where the atoms form a periodic arrangement.

3.4.9 Resistor:

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element.

Fig: 3.3.8.1: Resistor

The current through a resistor is in direct proportion to the voltage across the resistor's terminals.

The ratio of the voltage applied across a resistor's terminals to the intensity of current in the circuit is called its resistance, and this can be assumed to be a constant (independent of the voltage) for ordinary resistors working within their ratings.

3.4.10 Diode (IN 4007):

In electronics, a diode is a two-terminal electronic component with asymmetric conductance, it has low (ideally zero) resistance to current flow in one direction, and high (ideally infinite) resistance in the other. A semiconductor diode, the most common type today, is a crystalline piece of semiconductor material with a p–n junction connected to two electrical terminals. A vacuum tube diode has two electrodes, a plate (anode) and a heated.

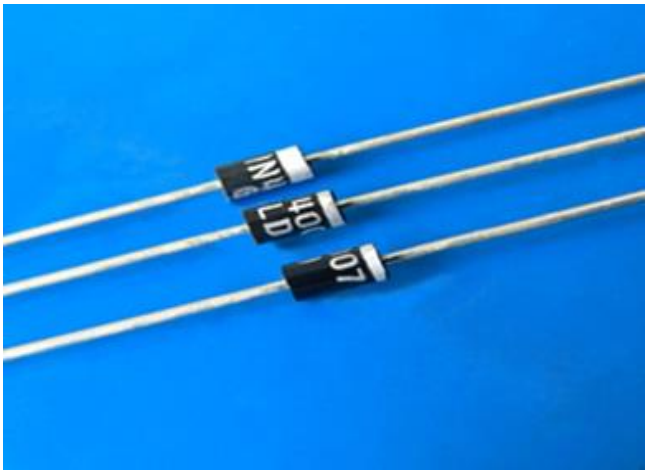


Fig: 3.3.9.1: Diode (IN 4007)

The most common function of a diode is to allow an electric current to pass in one direction (called the diode's forward direction), while blocking current in the opposite direction (the reverse direction). Thus, the diode can be viewed as an electronic version of a check valve. This unidirectional behavior is called rectification, and is used to convert alternating current to direct current, including extraction of modulation from radio signals in radio receivers these diodes are forms of rectifiers.

We used IN 4007 which is a simple, very common rectifier diode. Often used for reverse voltage protection, the 1N4007 is a staple for many powers, DC to DC step up, and breadboard projects. 1N4007 is rated for up to 1A/1000V.

3.5.1 Vero Board:

Strip Board is a widely used type of electronics prototyping board characterized by a 0.1-inch (2.54 mm) regular (rectangular) grid of holes, with wide parallel strips of copper cladding running in one direction all the way across one side of the board. It is commonly known by the name Vero Board. With car, it is possible to brake between holes to allow for components that have two pin rows only one position apart such as twin row headers.

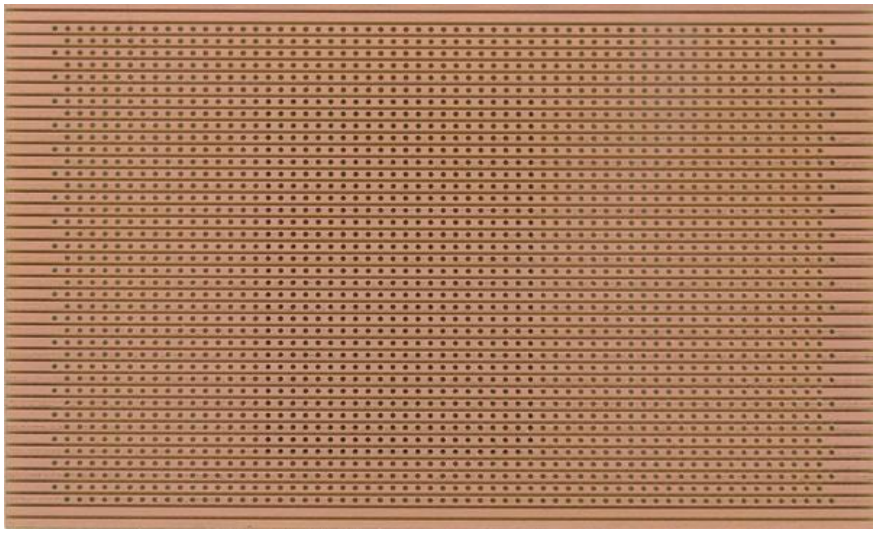


Fig. 3.3.10.1: Vero Board

3.5.2 Wire:

A wire is a single, usually cylindrical, flexible strand. Wires are used to bear carry electricity and telecommunications signals. Standard sizes are determined by various wire gauges. The term wire is also used more loosely to refer to a bundle of such strands, as in ‘multi stranded wire’, which is more correctly termed a wire rope in mechanics, or a cable in electricity.

Fig: 3.3.11.1: Connecting Wire

Although usually circular in cross-section, wire can be made in square, hexagonal, flattened rectangular or other cross-sections, either for decorative purposes, or for technical purposes such as high-efficiency voice coils in loudspeakers. Edge-wound coil springs, such as the Slinky toy, are made of special flattened wire.

3.5.3 LED:

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

Fig: 3.3.12.1: Indicator LED

3.5.4 Ultrasonic Sensor:

Ultrasonic ranging and detecting devices use high frequency sound waves called ultrasonic waves to detect presence of an object and its range. Normal frequency range of human ear is roughly 20Hz to 20,000Hz. Ultrasonic sound waves are sound waves that are above the range of human ear, and thus have frequency above 20,000Hz. An ultrasonic sensor necessarily consists of a transducer for conversion of one form of energy to another, a housing enclosing the ultrasonic transducer and an electrical connection.

3.5.5 Ultrasonic Transmitter:

Before transmitting the ultrasonic wave, there is a part which is ultrasonic wave generator that functions to generate ultrasonic wave. In that part, there is timing instruction means for generating an instruction signal for intermittently providing ultrasonic waves. This signal will send to an ultrasonic wave generator for generating ultrasonic waves based on the instruction signal from said timing instruction means (transform electrical energy into sound wave). After ultrasonic wave was produced, ultrasonic transmitter transmits the ultrasonic waves toward a road surface to find out the obstacle. The range that obstacle detected is depends on the range of ultrasonic sensors that used.

Fig: 3.3.13.1: Ultrasonic Transmitter

3.5.6 Ultrasonic Receiver:

If the ultrasonic wave detects the obstacle, it will produce a reflected wave. An ultrasonic receiver is used for receiving the ultrasonic waves reflected from the road surface to generate a reception signal. There is ultrasonic transducer that will transform back the sound wave to electrical energy. This signal amplified by an amplifier.

The amplified signal is compared with reference signal to detect components in the amplified signal due to obstacles on the road surface. The magnitude of the reference signal or the amplification factor of the amplifier is controlled to maintain a constant ratio between the average of the reference signal and the average of the amplified signal.

Fig: 3.3.14.1: Ultrasonic Receiver

3.5.7 Buzzer Volume:

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

Fig: 3.3.15.1: Buzzer Volumne

3.5.8 Servo Motor:

A servo motor is a self-contained electrical device that moves parts of a machine with high efficiency and great precision. In simpler terms, a servo motor is a BLDC motor with a sensor for positional feedback. This allows the output shaft to be moved to a particular angle, position, and velocity that a regular motor cannot do. However, a servo motor is only one part of a closed-loop motion control system. A complete motion system includes an amplifier, control circuit, drive gears, potentiometer, shaft, and either an encoder or resolver as well as the servo motor.

Fig: 3.3.16.1: Servo motor

3.5.9 **Battery Case:**

This is a 4 x AA Battery Holder Box, without cover. The case box can keep batteries organized and protector. The holder case is designed with leads for easy to solder and connect. This Battery holder case is perfect for the devices need a 12V external battery.

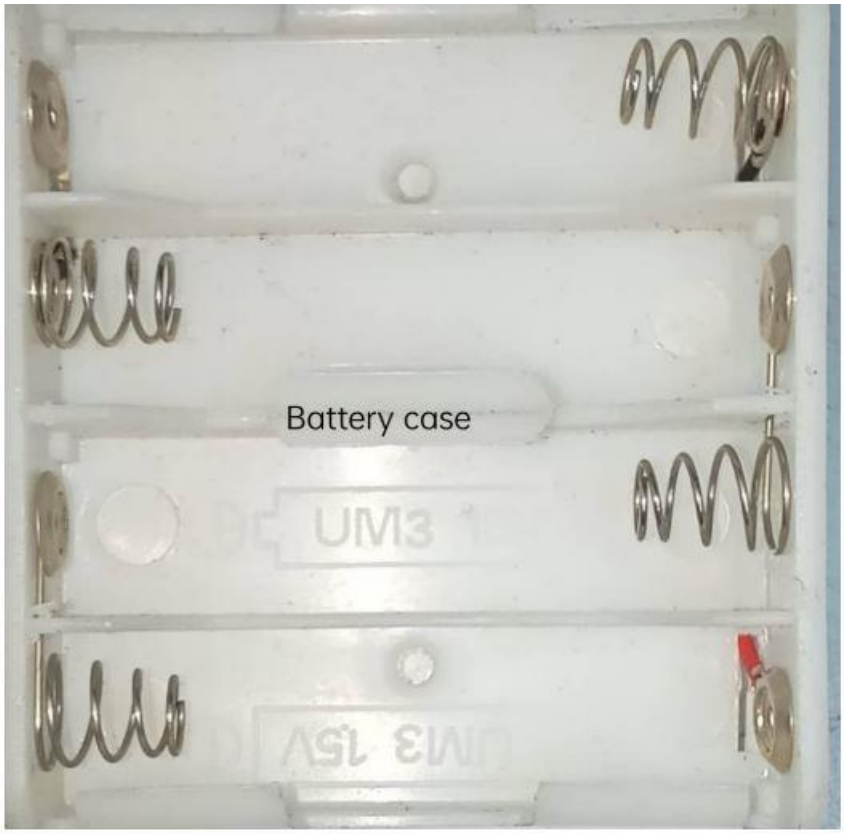


Fig: 3.3.17.1: Battery Case

3.5.10 **Programming:**

Arduino is the world's lead offers a range of software to world's leading open – source hardware and software ecosystem. The Company software tools, hardware platforms and documentation enabling almost anybody to be creative with technology. To unpopular tool for lot product development as well as one of the most successful SEM / STEAM educations. Hundreds of thousands of designers, engineers, students, re and makers around the world are using Arduino to innovate in music, games, toys, smart homes, farming, autonomous vehicles, and more. To do so use the Arduino programming language based on wiring and the Adriano software (IDE) base on processing.

CHAPTER 4

VIEW OF PROJECT

CHAPTER 4
View of Project

4.1 Full view of the project:

This is our full view of the project. This study developed a prototype alcohol detection and engine locking system.

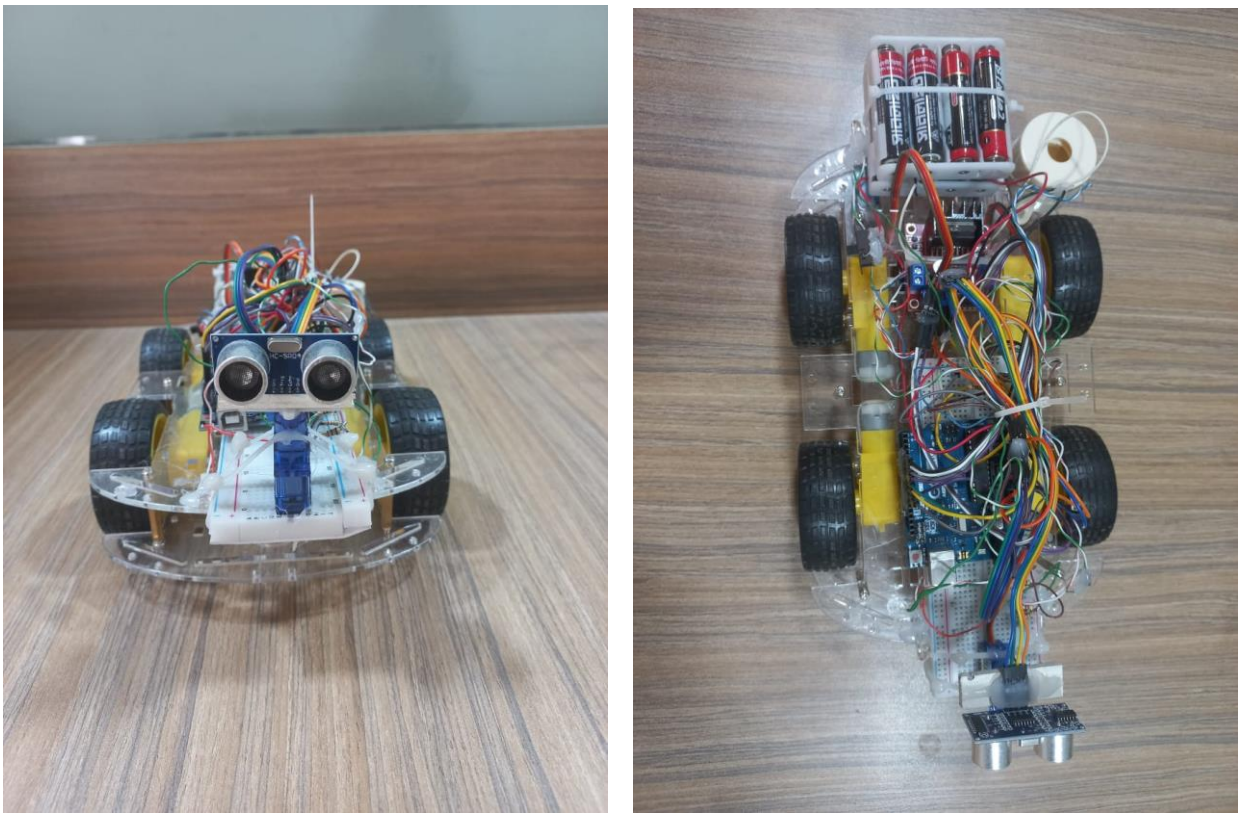


Fig: 4.1: Project Overview

Well and the whole system is successfully accomplished. The safety distance is determined then the vehicle system is braked when the obstacle is detected. The ranging accuracy of ultrasonic sensor in this prototype is about 40cm and works effectively within the prescribed limit. There are two manual switches on the top of car. Number one is Auto and manual switch another one is traffic jam and highway mode switch.

The driver can select any mode depend on situation. 5V piezo buzzer sounder it can generate the warning sound for driver in emergency situation all electronics component is connected with Arduino microcontroller board. When this car will be auto mode selected and its jam mode. This car will always maintain a certain distance from the car in front. So, it will be very helpful for car driver. Similarly, when car will be highway mode than our device will alert the driver if the car in front is within 4 feet. If the driver is not alert and the car in front moves within 2 feet, our car will brake automatically. There is 12V battery for control circuit this circuit operated by powerful microcontroller. The ultrasonic sensor module can masur the distance of obstacle. LM7805 Voltage regulator IC convert the voltage 12V to 5V. This 5V power provided the perfect voltage to ultrasonic sound and others module. The L293D DC motor driver module control the 4-wheel DC gear motor. Motor driver module move the motor clockwise and anticlockwise also stop command.

CHAPTER 5

RESULT AND DISCUSSION

CHAPTER 5

RESULT AND DISCUSSION

5.1 Data Table:

Calculation: We get,

for $distance, s = 100cm = 1m$, $time, t = 4.7s$

We know

Normal Speed, $v = \frac{s}{t}$

$$\therefore v = \frac{1}{4.7}\ ms^{-1}$$

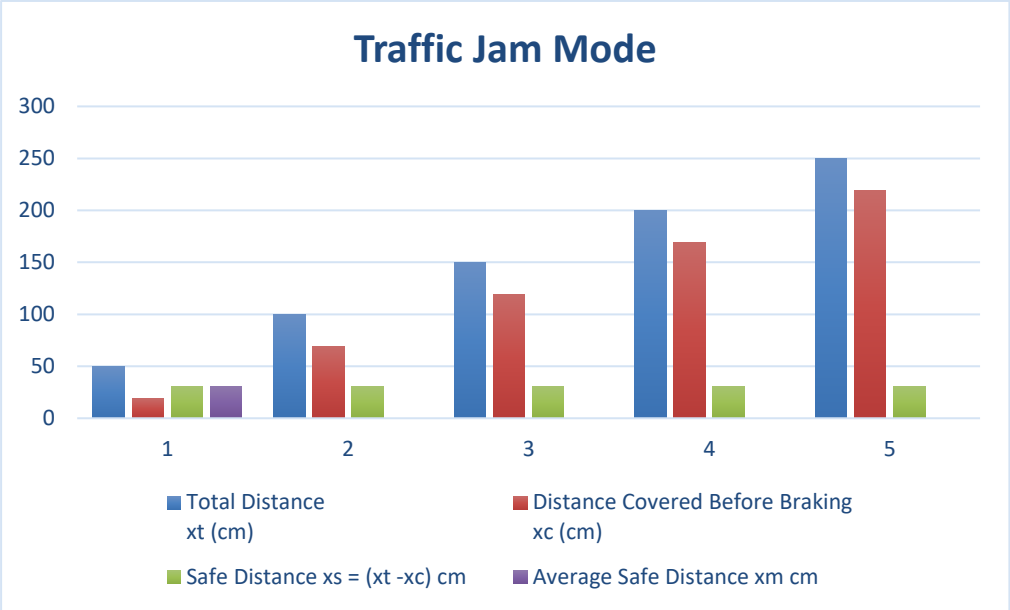
$$= 0.213\ ms^{-1}$$

Table 5.1.1: Mean or Average velocity

SL no.	Distance $s\ (cm)$	Time $t\ (s)$	Velocity $v\ (cms^{-1})$	Mean/ Average Velocity (cms^{-1})
01	50	2.6	19.23	20.98
02	100	4.7	21.28	
03	150	7.1	21.13	
04	200	9.3	21.51	
05	250	11.5	21.74	

Table 5.1.2: Safe Distance on Traffic Jam Mode

SL no.	Total Distance $x_t\ (cm)$	Distance Covered Before Braking $x_c\ (cm)$	Safe Distance $x_s = (x_t - x_c)$ (cm)	Mean/ Average Safe Distance $x_m(cm)$
01	50	19.2	30.8	30.78
02	100	69.3	30.7	
03	150	119.3	30.7	
04	200	169.2	30.8	
05	250	219.1	30.9	



Graph: Safe Distance on Traffic Jam Mode

5.2 Final Overview of Project:

In this project, we have checked the working of our project, we connected it with a battery and whose braking system is controlled by a DC gear motor and Servomotor. This technique is eco-friendly and this work is an attempt to reduce Accidents while in critical driving conditions. We have tested the working of the System by placing various objects ahead as obstacles. The system responded by reducing the speed of the vehicle when the obstacle is placed at various distances

From it. Also, the system stopped automatically in restricted areas. It gave very Accurate measurement according to limit of values interpreted.

5. 3 Device Systems Test:

It is any type of automatic safety mechanism that is incorporated in the vehicle to control its operation during start – up to or run time. One such method commonly used is to activate deactivate the vehicle ignition system. Ignition interlock consists of 5V DC L293D motor driver that is interfaced to microcontroller to control the vehicle ignition during vehicle start up based upon the short distance of the car. When the car moves on the road in the jam this time car move to forward. Ultrasonic sensor detects the distance in front of next car.

5. 4 Ultrasonic Sensor:

In this stage, when the car is switched on the system measures the level of distance. When car well be jam mode if car distance < 1.5’ than car movement will be stop. When car will be jam mode and distance > 1.5’ than car movement will be forward.

When car will be highway mode if car distance < 2’ than car speed will be half. When car will be HI way mode and distance < 1.5’ than car movement will be full brake.

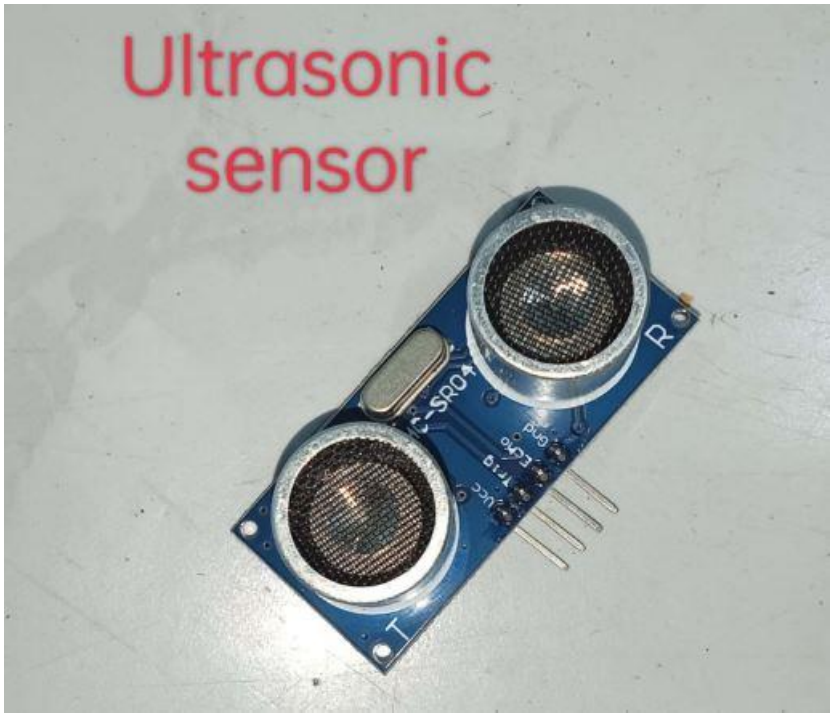


Fig: 5.1: Ultrasonic Sensor

5.5 Advantages of this Project:

The expert, who is a member of the Road Safety Management Council, said that the automatic braking system recognizes the threat of an imminent collision and warns the driver, so that he is able to either brake or maneuver. Should the driver fail to take action, the system causes the car to brake automatically.

He added that the system helps prevent, or at least mitigate, between 20 and 40 percent of motor vehicle accidents in which injuries are caused.

The system causes the car to reduce its speed, meaning that even if the accident is not avoided in full, the risk of injury is at least reduced.

The cost of the entire project was about 4000 taka including transportation cost. The materials for this project are purchased from retail stores so the cost is a little higher. Cost will be lower if manufactured commercially. It can be spread widely among people for awareness. By doing this, accidents can be prevented.

5.6 Limitations:

- It cannot work beyond limit 13 Feet
- Eye Sensor is not more professional.

CHAPTER 6

CONCLUSION

CHAPTER 6
CONCLUSION

6.1 Conclusion:

Our auto braking system gives the automotive safety for the long run and advance this system are often for to prevent the accident and protect the vehicle to occupied and after they are into one system. Execution of such a propelled framework can be made mandatory like wearing of safety belts with the goal that mischance's can be deflected to some degree. Ultrasonic braking approach speaks to a huge movement from the conventional way to deal with wellbeing, yet it is crucial to accomplishing the significant advantages.

6.2 Future Recommendation:

Our future course of action is to assemble a system on vehicle & perform various experimentations by varying different

Parameters. Those parameters are as follows:

- Vehicle Speed
- Left right back side obstacle distance
- Sensor Position
- Varying deceleration rate

References

[1] Thepade,N. , Thombare ,L., Varude,p., Umbarkar,A., .”Braking system with Automatic Pneumatic Bumper.” International Journal of Scientific Research & Development | Vol. 4, Issue 04,2016.

[2] http://www.aa1car.com/ this website contains technical articles, books and Manuals that help us find what’s wrong with our vehicle and what needed to fix it.

[3] David Epsilon, An embedded software premier, Pearson education, 1999.

[4] Joshua Pérez, Fernando Saco, Vicente MI lanes, Antonio Jiménez, Julio C. Diaz and Teresa de Pedro, an RFID based Intelligent Vehicle speed controller using active traffic signals, SENSORS 2010, 15872 5888; doi:10.3390/s100605872.

[5] Van NE’s. N; Houtenbos. M; van SC Hagen. I: Improving Speed behavior: The Potential of In-Car Speed Assistance and Speed Limit Credibility. IET Intel. Transp. Syst. 2008, 2, 323 330.

[6] MI lanes, V. Onieva, E. Perez, J. De Pedro, T. Gonzalez, C. Control of Velocidad Adaptativo para Entornos Urbanos Congestionados. Rev. Iberoam, automat. Informat. Ind.2009, 66-73.

[7] “*Intelligent Mechatronic Braking System”* Published By -. G.V. Sairam, B. Suresh, CH. Sai Hemanth, K. Krishna sai

[8] Lennon,W.K., and. Passino,K.M . ” *Ieee Transaction On Control System Technology”*, VOL.7, NO.2, 1999

[9] Dr. Stephen Amell “*IDEA Program Transportation Research Board National Research Council*” ,May 31,1996

[10] C Govar , I Knight , F Okoro, I Simmons, G Coupr , P Massle, And B Smith presented “*automatic energy brake system : technical requirement , cost and benefits”* PPR 227 VERSION 1.1

[11] Aleksendric, Dragan, University of balgrade, Faculty of mechanical engineering, Automotive Department , Serbia presented paper on “*Intelligent Control Of Commercial Vehicle Braking System Function”*

Appendix

Programming of This Project:

```
#include <Servo.h>          //Servo motor library. This is standard library
#include <NewPing.h>        //Ultrasonic sensor function library. You must
install this library

//our L298N control pins
const int LeftMotorForward = 4;
const int LeftMotorBackward = 5;
const int RightMotorForward = 7;
const int RightMotorBackward = 6;

//sensor pins
#define trig_pin 8 //analog input 1
#define echo_pin 9 //analog input 2

#define maximum_distance 200
boolean goesForward = false;
int distance = 100;

NewPing sonar(trig_pin, echo_pin, maximum_distance); //sensor function
Servo servo_motor; //our servo name


void setup(){

  pinMode(RightMotorForward, OUTPUT);
  pinMode(LeftMotorForward, OUTPUT);
  pinMode(LeftMotorBackward, OUTPUT);
  pinMode(RightMotorBackward, OUTPUT);

  servo_motor.attach(10); //our servo pin

  servo_motor.write(115);
  delay(2000);
  distance = readPing();
  delay(100);
  distance = readPing();
  delay(100);
  distance = readPing();
  delay(100);
  distance = readPing();
  delay(100);
}

void loop(){

  int distanceRight = 0;
  int distanceLeft = 0;
```

```
  delay(50);

  if (distance <= 50){
    moveStop();
    while(distance <= 100)
    {
      digitalWrite(11,HIGH);
      delay(150);
      digitalWrite(11,LOW);
      distance = readPing();
      delay(150);
    }

  }
  else{
    digitalWrite(11,LOW);
    moveForward();
  }
    distance = readPing();
}

int lookRight(){
  servo_motor.write(50);
  delay(500);
  int distance = readPing();
  delay(100);
  servo_motor.write(115);
  return distance;
}

int lookLeft(){
  servo_motor.write(170);
  delay(500);
  int distance = readPing();
  delay(100);
  servo_motor.write(115);
  return distance;
  delay(100);
}

int readPing(){
  delay(70);
  int cm = sonar.ping_cm();
  if (cm==0){
    cm=250;
  }
  return cm;
}
```

```
void moveStop(){
  goesForward=false;
  digitalWrite(RightMotorForward, LOW);
  digitalWrite(LeftMotorForward, LOW);
  digitalWrite(RightMotorBackward, LOW);
  digitalWrite(LeftMotorBackward, LOW);
}

void moveForward(){

  if(!goesForward){

    goesForward=true;

    digitalWrite(LeftMotorForward, HIGH);
    //analogWrite(LeftMotorForward, 127);
    digitalWrite(RightMotorForward, HIGH);
    //analogWrite(RightMotorForward, 127);

    digitalWrite(LeftMotorBackward, LOW);
    digitalWrite(RightMotorBackward, LOW);
  }
}

void moveBackward(){

  goesForward=false;

  digitalWrite(LeftMotorBackward, HIGH);
  digitalWrite(RightMotorBackward, HIGH);

  digitalWrite(LeftMotorForward, LOW);
  digitalWrite(RightMotorForward, LOW);

}

void turnRight(){

  digitalWrite(LeftMotorForward, HIGH);
  digitalWrite(RightMotorBackward, HIGH);

  digitalWrite(LeftMotorBackward, LOW);
  digitalWrite(RightMotorForward, LOW);

  delay(500);

  digitalWrite(LeftMotorForward, HIGH);
```

```
  digitalWrite(RightMotorForward, HIGH);

  digitalWrite(LeftMotorBackward, LOW);
  digitalWrite(RightMotorBackward, LOW);



}

void turnLeft(){

  digitalWrite(LeftMotorBackward, HIGH);
  digitalWrite(RightMotorForward, HIGH);

  digitalWrite(LeftMotorForward, LOW);
  digitalWrite(RightMotorBackward, LOW);

  delay(500);

  digitalWrite(LeftMotorForward, HIGH);
  digitalWrite(RightMotorForward, HIGH);

  digitalWrite(LeftMotorBackward, LOW);
  digitalWrite(RightMotorBackward, LOW);
}
```