AUTOMATIC BRAKING SYSTEM

A PROJECT REPORT

Submitted to

GONDWANA UNIVERSITY, GADCHIROLI

Sbmitted By

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In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS & TELECOMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

GOVERNMENT COLLEGE OF ENGINEERING,

CHANDRAPUR-442403

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Guided By

Prof. M. P. Dongare

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CERTIFICATE

This is to certify that the project entitled "**Automatic Braking System**" has been carried out by the team under my guidance inpartial fulfillment of the degree of Bachelor of Engineering in Electronics & Telecommunication Engineering of Gondwana University, Gadchiroli during the academic year 2022-2023.

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(Dr. S. G. Akojwar)

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PROJECT APPROVAL SHEEET

Following team has done the appropriate work related to the "**Automatic Braking System**" in partial fulfillment for the award of Bachelor of Engineering in Electronics & Telecommunication Engineering of "Gondwana University, Gadchiroli" and is being submitted to Government College of Engineering, Chandrapur.

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ACKNOWLEGMENT

"We have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals. We would like to extend our sincere thanks to all of them.

We are highly indebted to Prof. M. P. Dongare, Assistant Professor Electronics & Telecommunication Engineering for his guidance and constant supervision as well asfor providing necessary information regarding the project & also for their support in completing the project.

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We would like to take this opportunity to thank H. M. Raza, Head of department, Electronics & Telecommunication Engineering for his support & encouragement.

Our thanks and appreciation also go to our colleague in developing the project and people who have willingly helped us out with their abilities.''

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ABSTRACT

An automatic Braking system is mostly an effective mechatronic system that has an Ultrasonic wave emitter provided on the front portion of a car producing and emitting Ultrasonic waves. An Ultrasonic receiver is additionally placed on the front portion of the car operatively receivinga reflective Ultrasonic wave signal. The reflected wave (detected pulse) gives the space between the obstacle and therefore the vehicle.

In this project, we will be using an ultrasonic sensor, an Arduino Uno, an L298N motor driver, a DC motor, and a servo motor to develop an automaticbraking system. The speed of a DC motor can be controlled by changing its input voltage. A widely used technique to accomplish this is Pulse Width Modulation (PWM). PWM is techniquein which the average value of the input voltage is adjusted by sending a series of ON-OFF pulses.

An automatic Braking system is an intelligent mechatronic system includes an Ultrasonic wave emitter provided on the front portion of a car producing and emitting Ultrasonic waves. 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.

CHAPTER 1

INTRODUCTION

1.1 Background

Automatic braking may be a safety technology that automatically activates the vehicle's brake, to the point, when necessary. Systems can vary from pre-charging brakes to slowing the vehicle to reduce damage. Nowadays, some advanced and updated systems completely take over and stop the vehicle before a collision happen. The precise capabilities of their car's automatic braking system. Regardless of a vehicle's autonomous technologies, drivers should remain conscious of their surroundings and maintain control in the least times. the 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 special name for such technologies, but the rock bottom line is that the brake assist is supposed to attenuate accidents.

An automatic braking system is an important and crucial part of safe technology for automobiles. It is an advanced system, specifically designed to either prevent a possible collision or reduce the speed of the moving vehicle, prior to a collision with another vehicle, pedestrian, or an obstacle of some sort. These systems are a combination of sensors, such as ultrasonic to detect for possible objects in front of the vehicle, and then use brake control toprevent collision if the object is in fact,detected. Automatic brakes are one of many car safety features and are often integrated with other technology, such as pre-collision systems and adaptive cruise control. An automatic braking system is a system that automatically applies the brakes in a vehicle when it senses an obstacle or an object in its path. In this project, we will be using an ultrasonic sensor, an Arduino Uno, an L298N motor driver, a DC motor, and a servo motor to develop an automatic braking system.

CHAPTER 2

LITERATURE REVIEW

2.1 Background Study

Automatic braking systems (ABS) have been the subject of extensive research and development over the past few decades. The purpose of this system is to prevent or reduce the severity of collisions by automatically applying the brakes when the system detects an imminent collision.

Several studies have evaluated the effectiveness of ABS in reducing the number and severity of collisions. A study by the National Highway Traffic Safety Administration (NHTSA) foundthat vehicles equipped with ABS were 31% less likely to be involved in fatal crashes than vehicles without ABS. Another study conducted by the Insurance Institute for Highway Safety (IIHS) found that vehicles equipped with forward collision warning (FCW) and autonomous emergency braking (AEB) reduced rear-end crashes by 40%.

Research has also been conducted on the development of ABS technology. A study by M. I. Saripalle et al. evaluated the performance of an adaptive ABS algorithm in various drivingscenarios. The results showed that the adaptive algorithm improved the performance of theABS system in comparison to a fixed-gain algorithm.

Additionally, research has been conducted on the development of ABS for specific applications, such as off-road vehicles and motorcycles. A study by S. T. Cherian et al. evaluated the effectiveness of ABS in reducing the stopping distance of off-road vehicles. The results showed that the ABS system reduced the stopping distance by up to 24% in some scenarios. Another study by A. J. Wang et al. evaluated the performance of ABS on motorcycles. The results showed that the ABS system reduced the stopping distance and improved the stability of the motorcycle during emergency braking.

In conclusion, ABS is an effective technology for reducing the number and severity of collisions. Research has been conducted on the development and performance of ABS technology, as well as its effectiveness for specific applications such as off-roadvehicles and motorcycles.

2.2 Problem :

- Collision avoidance: The primary problem that automatic braking systems aim to address is collision avoidance. This involves detecting an imminent collision and applying the brakes to prevent or reduce the severity of the collision.

- False positives: One challenge with automatic braking systems is avoiding false positives, which can result in the brakes being applied unnecessarily. This can lead to discomfort and potentially dangerous situations, such as unexpected braking on a highway.

- Sensor limitations: Automatic braking systems rely on various sensors, such as cameras and radar, to Detect obstacles and potential collisions. However, these sensors may have limitations, such as reduced visibility in certain weather conditions or limitations in detecting certain types of obstacles.

- System integration: Automatic braking systems often need to integrate with other vehicle systems, such as steering and traction control. Ensuring smooth and effective integration can be a challenge.

- Cost: Implementing automatic braking systems can be expensive, particularly in older vehicles that may require significant retrofitting. This can be a barrier to widespread adoption of the technology.

- Driver acceptance: Some drivers may be hesitant to rely on automatic braking systems, particularly if they have concerns about the system's accuracy or effectiveness. Ensuring driver acceptance and trust in the system is an important consideration.

2.3 Project View:

The automatic braking system project aims to design, develop, and implement a reliable and effective system that utilizes ultrasonic sensors to detect obstacles or other vehicles in the path of a moving vehicle and automatically applies the brakes to avoid or mitigate collisions. The project aims to improve the safety of drivers and passengers by reducing the risk of accidents and improving the response time of the vehicle's braking system in potentially hazardous situations. The project will involve the selection and testing of ultrasonic sensors, development of algorithms to process sensor data, integration of the system with the vehicle's existing braking system, and testing in various driving scenarios to ensure the system's reliability and effectiveness. The project will also address safety concerns related to the use of the system and provide documentation for installation, use, and maintenance to ensure its safe and effective use. The project's ultimate goal is to create a system that enhances the safety of vehicles and reduces the number of accidents on the road.

2.4 Project Objectives

The objective of an automatic braking system using ultrasonic sensors is to enhance the safety of vehicles by detecting obstacles or other vehicles in the path of a moving vehicle and automatically applying the brakes to avoid or mitigate collisions. Some specific project objectives for such a system could include:

1. Designing and implementing a reliable and accurate ultrasonic sensor system thatcan detect obstacles or other vehicles within a certain range.
2. Developing algorithms to process sensor data and determine when to activate thebraking system.
3. Integrating the sensor system and algorithms with the vehicle's existing braking system to ensure a seamless and effective response.
4. Testing the system in various driving scenarios and conditions to ensure its reliability and effectiveness in real-world situations.
5. Identifying and mitigating potential safety hazards or issues related to the use of the system, such as false positives or failure to detect obstacles in certain conditions.
6. Documenting the system's performance and providing instructions for installationand maintenance to ensure its safe and effective use.

7. Overall, the objective is to create a system that enhances the safety of drivers and passengers by reducing the risk of collisions and improving the response time of the vehicle's braking system in potentially hazardous situation.

2.5 Project Scope

The scope of an automatic braking system using ultrasonic sensors project may include severalaspects, such as:

1. System design: The project may involve designing and developing a complete automatic braking system, which includes the ultrasonic sensors, processing algorithms, and the control unit for activating the brakes.
2. Sensor selection: The project may involve selecting and testing different types of ultrasonic sensors to determine their accuracy, range, and reliability for detecting obstacles.
3. Algorithm development: The project may require developing algorithms to process the sensor data and determine the appropriate response, such as applying the brakes.
4. Integration with the vehicle: The project may involve integrating the automatic braking system with the vehicle's existing braking system to ensure a seamless and effective response.
5. Testing: The project may involve testing the system in various driving scenarios and conditions to ensure its reliability and effectiveness in real-world situations.
6. Safety considerations: The project may require addressing safety concerns related to the useof the automatic braking system, such as false positives, system failures, or unintended consequences.
7. Documentation: The project may involve creating documentation that provides instructions for installation, use, and maintenance of the automatic braking system.

The scope of the project may vary depending on the specific objectives and requirements of the project, available resources, and timeline. However, it is essential to define the project's scope clearly to ensure that the project delivers the expected results within the allocated budget and time.

CHAPTER 3

PROJECT DESCRIPTION

3.1 Introduction

The automatic braking system using ultrasonic sensors and DC gear motor, servomotor, and Arduino Uno is a project that aims to create a reliable and effective system to detect obstacles or other vehicles in the path of a moving vehicle and automatically apply the brakes to avoid or mitigate collisions. The system is designed to be integrated with the vehicle's existing braking system and utilizes ultrasonic sensors, a DC gear motor, a servomotor, and an Arduino Uno microcontroller board.

The ultrasonic sensors are used to detect the distance between the vehicle and any obstacles or vehicles in its path. The Arduino Uno board processes the sensor data and activates the servomotor, which controls the position of the brake pedal, to apply the brakes when an obstacle is detected within a certain range. The DC gear motor is used to actuate the servomotor, which is attached to the brake pedal.

The project involves designing and developing the automatic braking system, selecting and testing the components, and integrating the system with the vehicle's braking system. The system will be tested in various driving scenarios and conditions to ensure its reliability and effectiveness. Safety concerns related to the use of the system, such as false positives or system failures, will be addressed, and instructions for installation, use, and maintenance will be provided.

The project requires knowledge of electronics, programming, and mechanical systems. It offers the opportunity to enhance knowledge and skills in these areas and contribute to the development of a system that can potentially reduce the number of accidents on the road and improve the safety of drivers and passengers.

The project aims to develop an automatic braking system using ultrasonic sensors and DC Gear motor,servomotor to enhance the safety of vehicles. The system will detect obstacles or other vehicles in the path of a moving vehicle using ultrasonic sensors and automatically apply brakes to avoid or mitigate collisions. The project will involve the following steps:

Sensor selection and testing: Different types of ultrasonic sensors will be selected and tested for their accuracy, range, and reliability in detecting obstacles.

Algorithm development: Algorithms will be developed to process the sensor data and determinethe appropriate response, such as applying the brakes. The algorithm will take into account the speed and distance of the vehicle from the obstacle and calculate the required braking force.

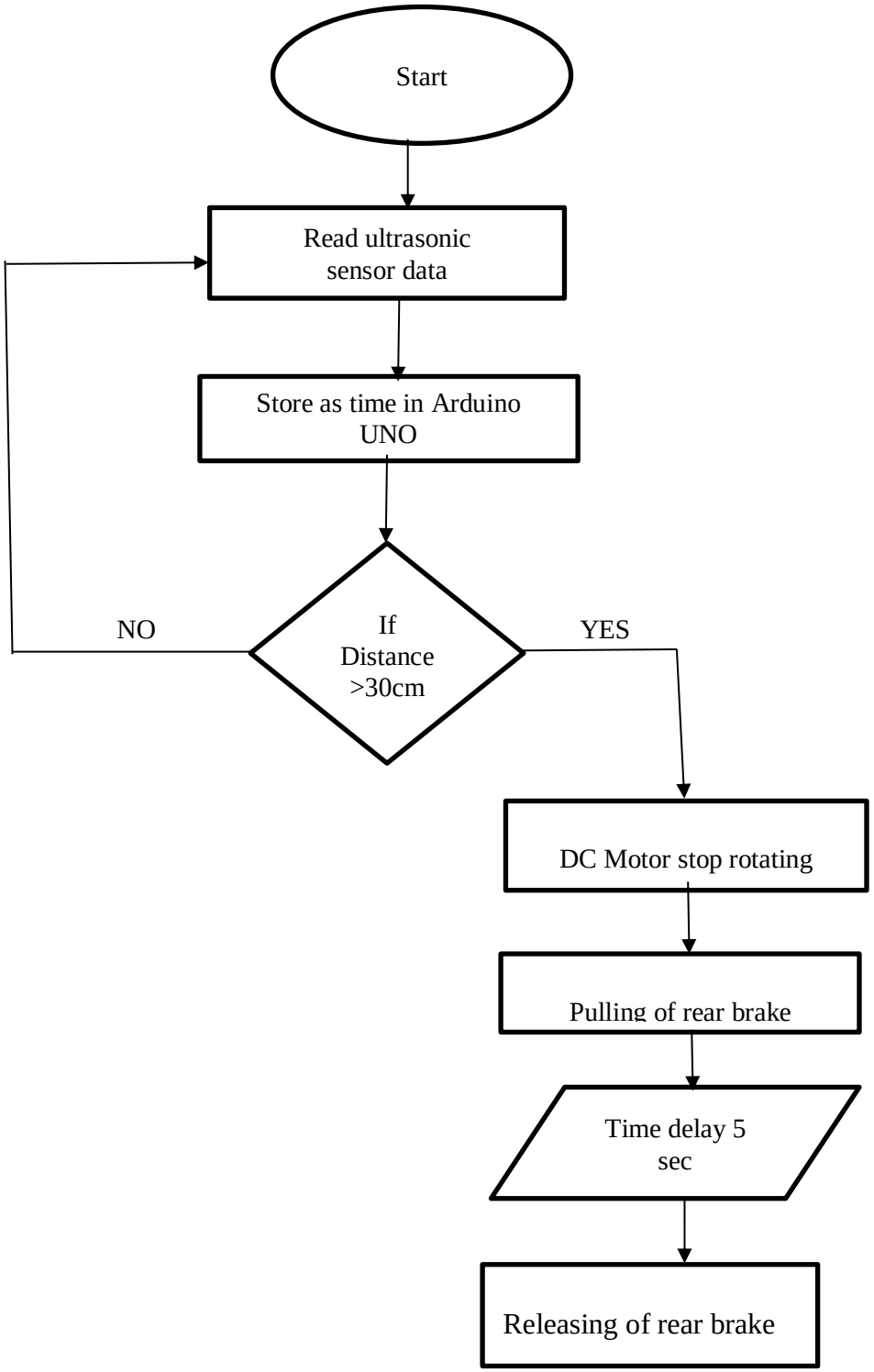
Integration with DC gear motor and servomotor: The system will use DC gear motor to control the braking force applied to the vehicle and servomotor to control the position of the braking system. The braking force will be increased or decreased by adjusting the speed of the DC gear motor, and the position of the braking system will be controlled by the servomotor.

System integration: The automatic braking system will be integrated with the vehicle's existingbraking system to ensure a seamless and effective response. The system will be activated when the ultrasonic sensors detect an obstacle or other vehicle in the path of the vehicle, andthe braking force will be applied accordingly.

Testing: The system will be tested in various driving scenarios and conditions to ensure its reliability and effectiveness in real-world situations. The system's response time, accuracy, reliability will be measured, and any issues or safety concerns will be addressed.

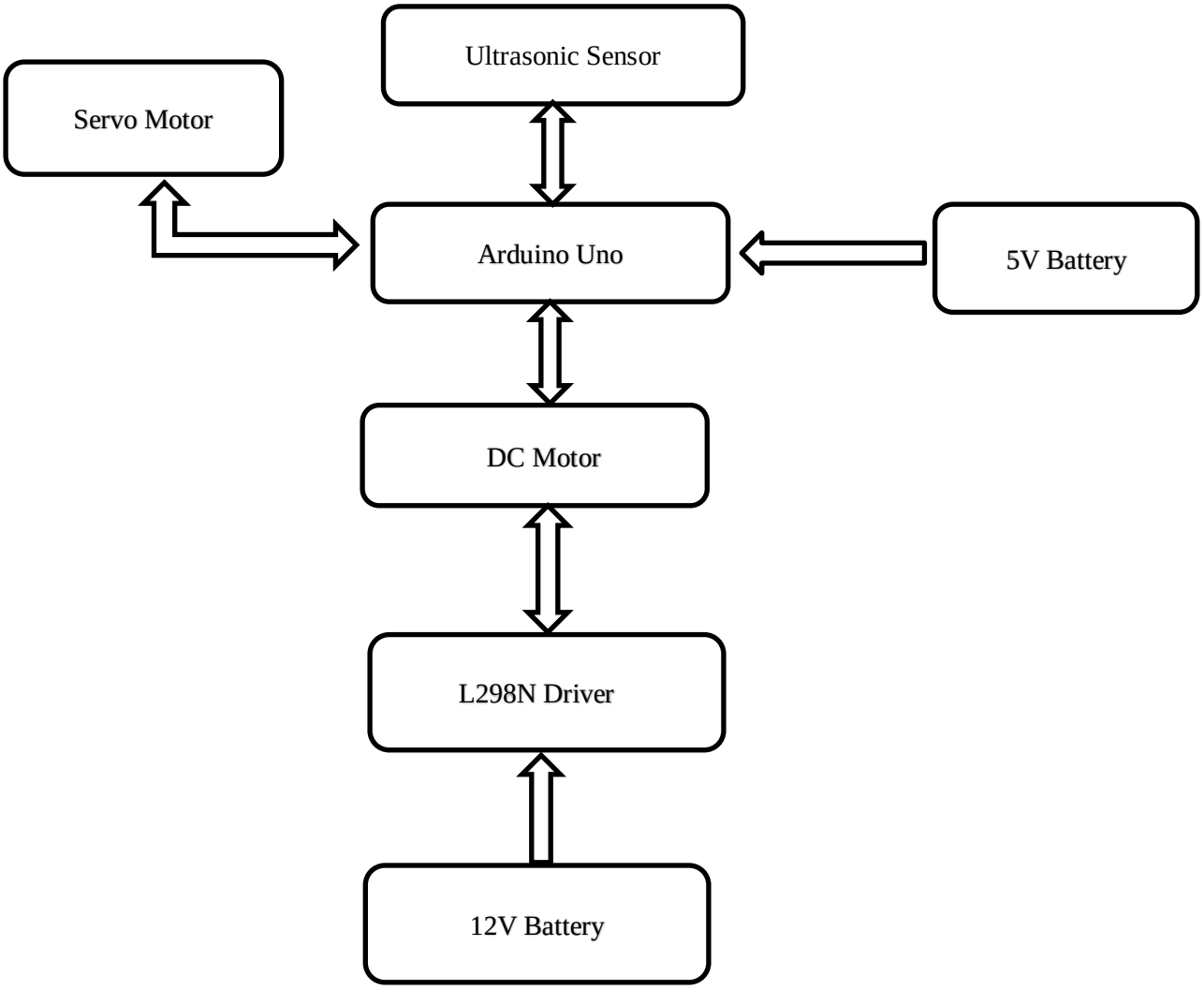
Documentation: The project will provide documentation that provides instructions for installation, use, and maintenance of the automatic braking system. The documentation will include a user manual, installation guide, and maintenance guide to ensure the system's safe and effective use.

3.2 Flow Chart :



CHAPTER 4

BLOCK DIAGRAM



CHAPTER 5

HARDWARE COMPONENT

5.1Ultrasonic sensors

- Ultrasonic sensors are electronic devices that use sound waves with frequencies higher than the humanhearing range (typically above 20 kHz) to detect and measure distances to objects. These sensorsemit a burst of sound waves and then listen for the echoes that bounce back from nearby objects.
- Ultrasonic sensors work based on the principle of echolocation, similar to how bats navigate and huntfor prey. They measure the time it takes for the sound waves to travel from the sensor to the object and back again, and use this information to calculate the distance to the object.
- Ultrasonic sensors can be used in a variety of applications, such as in industrial automation, robotics, automotive parking systems, and security systems. They are also commonly used in medical imaging equipment, such as ultrasound machines, to create images of internal organs and tissues.

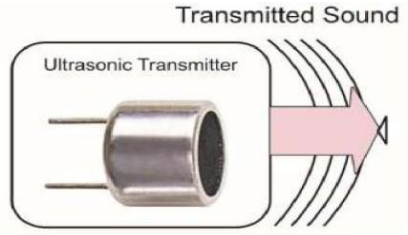
Fig 2 : Ultrasonic sensor

- One of the advantages of ultrasonic sensors is that they can detect objects regardless of their color or texture, making them suitable for use in a wide range of environments. They are alsorelatively inexpensive and easy to use, although they may have some limitations in detectingcertain types of objects or in noisy environments.
- HC-SR04 is a popular ultrasonic sensor module that is commonly used for distance measurementapplications. It consists of an ultrasonic transmitter and receiver module, and can accuratelymeasure distances from 2cm to 400cm (or 1 inch to 13 feet).

- The sound waves are then reflected back to the sensor, and the time taken for thesound wave to travel to the object and back is measured. This time can be used to calculatethe distance to the object.

- The HC-SR04 ultrasonic sensor is a simple and cost-effective solution for distance measurement, and is widely used in robotics, automation, and other applications. It can be easily interfaced with microcontrollers such as Arduino, and there are many libraries available to simplify programming. However, it is important to note that the accuracy ofthe HC-SR04 sensor can be affected by environmental factors such as temperature and humidity, and it may also have difficulty detecting certain materials such as soft or absorbent surfaces.

Ultrasonic Sensors Transmitter :



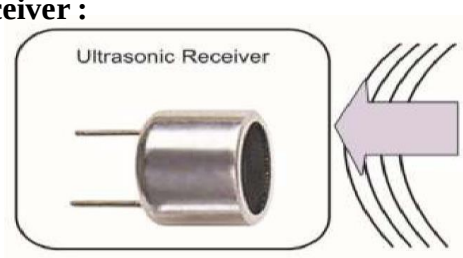
- An ultrasonic sensor transmitter is the component of the sensor that sends out high-frequency Sound waves. The transmitter converts an electrical signal into a sound wave, which is then emitted into the environment.

- Ultrasonic sensors typically use piezoelectric crystals as the transmitter. When an electrical current is applied to the crystal, it vibrates at a high frequency, producing a sound wave that travels through the air. The frequency of the sound wave is typically above 20,000 Hz, which is higher than the frequencyrange of human hearing.

- The ultrasonic sensor transmitter sends out a series of sound waves in a specific pattern or frequency,depending on the application. The sensor then listens for the echoes that bounce back from objects inthe environment and uses the time delay between the transmitted and received signals to calculate thedistance to the object.

- Ultrasonic sensors are widely used in industrial automation, robotics, automotive applications, and many other fields where non-contact distance measurement is required. They offer many advantagesover other sensing technologies, such as being able to detect objects regardless of their color or material and working in harsh environments.

Ultrasonic Sensors Receiver :



- An ultrasonic sensor is a device that uses sound waves with a frequency above the human hearing range to detect the distance of an object. It works by sending out a high-frequency soundwaveand then listening for the echo that bounces back off of an object. The sensor calculates the time it takesfor the sound wave to travel to the object and back and uses that time to determine the distance.

- A receiver is the component of an ultrasonic sensor that detects the echo signal that is reflected back from the object. The receiver listens for the reflected sound waves and converts them into an electrical signal that can be processed by the sensor's electronics.

- Ultrasonic sensors and receivers are used in a wide range of applications, including object detection, distance measurement, and flow rate measurement. They are commonly used in robotics, industrial automation, automotive applications, and even in medical devices.

Ultrasonic Range :

Ultrasonic Sensor Signals	**Range**
Maximum	1 Meter
Minimum	2 Centimeters

5.2 L298N Motor driver

The L298N motor driver is a popular integrated circuit (IC) used to control DC motors, stepper motors, and other types of motors in robotics and other applications. It can drive up to 2 DC motors or a single stepper motor, and canhandle a maximum current of 2A per channel.

The L298N has two H-bridges, which are circuits that allow the direction and speed of a motor to be controlled by adjusting the voltage and current flowing through it. Each H-bridge consists of four transistors that can be turned on or offto control the flow of current through the motor. By changing the state of these transistors, the L298N can control the direction and speed of the motor.

The L298N has a variety of pins for connecting to microcontrollers or other control circuitry, including inputs for direction and speed control, and feedbackpins for monitoring the state of the H-bridges. It also has built-in protection circuitry to prevent damage to the IC or the connected motors in case of over- current, over-temperature, or under-voltage conditions.

To use the L298N, you typically need to connect it to a microcontroller or other control circuitry, and program the controller to send appropriate signals to the L298N to control the motors. The specific wiring and programming required willdepend on the application and the specific components being used.

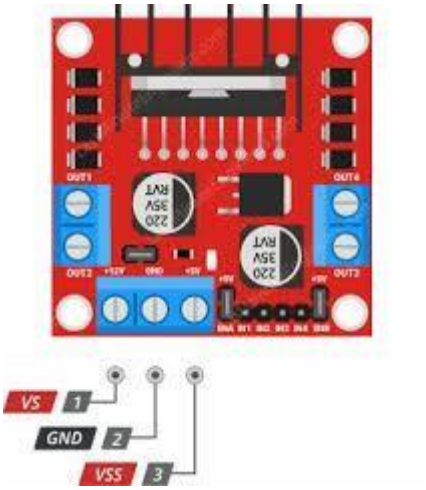


Fig. L298N Motor Driver

5.3 DC Motor

A DC motor is a type of electric motor that converts electrical energy into mechanical energy using the principle of electromagnetic induction. It worksbased on the interaction between a magnetic field and an electric current, producing rotational motion.

A typical DC motor consists of a stator (stationary part) and a rotor (rotating part), which are connected by a shaft. The stator includes a permanent magnet or

an electromagnet that produces a magnetic field, and the rotor includes a set ofconductors, which are arranged in a specific pattern and are connected to a commutator.

When a current is applied to the stator, it creates a magnetic field that interacts with the magnetic field produced by the rotor, causing the rotor to rotate. As therotor rotates, the commutator switches the direction of the current flow in the rotor conductors, which ensures that the rotor continues to rotate in the same direction.

DC motors are commonly used in a wide range of applications, including robotics, industrial machinery, electric vehicles, and household appliances. Theycan be controlled using a variety of methods, such as adjusting the voltage, current, or speed, to meet the specific requirements of the application.

Fig. DC Gear Motor

5.4 Disc Brake

A disc brake is a type of brake system that uses a flat metal rotor, typically made of cast iron or ceramic composites, to slow or stop the rotation of a wheel. It is commonly used in modern vehicles and bicycles as it provides superior stopping power and durability compared to traditional drum brakes.

When the brake pedal is pressed, hydraulic pressure is applied to a caliper, which contains pistons that push brake pads against the rotor. The resulting friction between the brake pads and rotor slows down or stops the rotation of the wheel.

Disc brakes have several advantages over drum brakes, including better heat dissipation, reduced brake fade, and improved wet weather performance. They also provide greater stopping power, which is important in high-performance vehicles and emergency situations.

While disc brakes are more expensive than drum brakes, they are becoming increasingly common in all types of vehicles due to their superior performance and safety benefits.

Fig. Disc Brake

5.5 Servo Motor

A servo motor is a type of motor that is commonly used in industrial and roboticsapplications. It is a rotary actuator that allows for precise control of angular position, velocity, and acceleration. Servo motors typically consist of a motor, a feedback device (such as an encoder or potentiometer), and a control circuit.

The feedback device provides information about the motor's current position, which is used by the control circuit to adjust the motor's output and maintain thedesired position. This closed-loop control system allows for very precise controlof the motor's mov Se ement.

Servo motors are often used in applications that require precise positioning, suchas in robotics, CNC machines, and automation systems. They are also commonlyused in RC (remote control) toys and other hobbyist applications.

One of the key advantages of servo motors is their high precision and accuracy,which makes them well-suited for tasks that require precise positioning and control. They also have a relatively high torque-to-weight ratio, which allows them to generate a lot of torque while remaining compact and lightweight.
Additionally, servo motors are capable of rapid acceleration and deceleration,making them well-suited for applications that require quick movements and changes in direction

Fig. Servo Motor

5.6 12V Battery

A 12V battery is a type of lead-acid battery that has a nominal voltage of 12 volts. This type ofbattery is commonly used in automotive, marine, and RV applications, as well as in backup power systems for homes and businesses. 12V batteries are rechargeable and typically have a capacity that is measured in ampere-hours (Ah). The actual capacity of a 12V battery will depend on its size and construction, as well as the rate at which it is discharged. Some common types of 12V batteries includeflooded lead-acid batteries, sealed lead-acid batteries, and lithium-ion batteries.

Fig. 12V Battery

5.7 5V Battery

A 5 volt battery is a type of battery that produces a nominal voltage of 5 volts. This voltage iscommonly used in electronic devices, especially microcontrollers and other low-power circuits.

Fig. 5V Battery

5.8 Jumper Wires

A jumper wire is an electrical wire that is used to connect two points in an electrical circuit. It is usually a small gauge wire with stripped ends that can be easily inserted into a circuit board or connected to other wires or components. Jumper wires are commonly used in prototyping and testing of electronic circuits,where they are used to make temporary connections between components or to bypass faulty or damaged components.

Jumper wires are an essential tool for anyone working with electronics. They are commonly used in breadboarding, prototyping, and troubleshooting of circuits, asthey allow for quick and easy connections between components. They can also beused to modify or extend existing circuits, making them a versatile tool for both hobbyists and professionals.

Fig. Jumper Wires

5.6 Chain Drive Mechanism

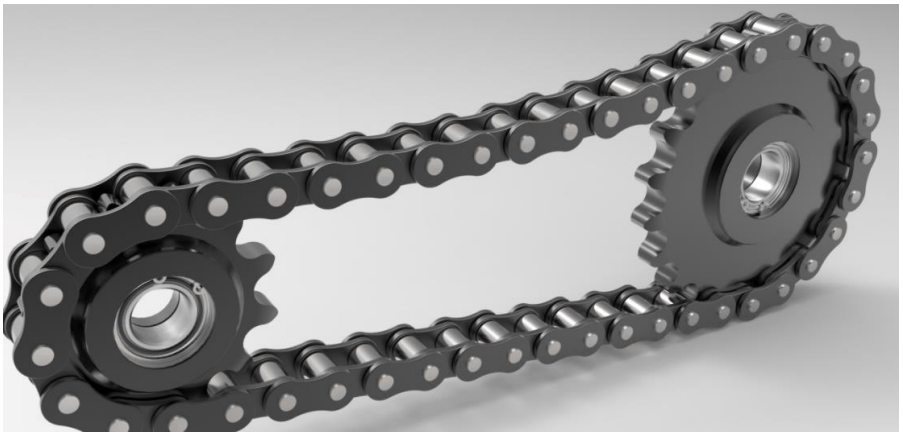


Fig. Chain Drive

- A chain drive mechanism is a type of power transmission system that uses a chain to transmit torque from one rotating shaft to another. It is commonly used in machinery such as motorcycles, bicycles, and industrial equipment.
- The chain drive mechanism typically consists of a chain that is guided over a set of sprockets. The sprockets are typically mounted on the shafts that need to be connected and are designed with teeth that engage the links of the chain. When one of the sprockets is rotated, the chain is pulled along, causing the other sprocket and shaft to rotate as well.
- Chain drives have several advantages over other types of power transmission systems, including their ability to transmit high torque loads, their durability and resistance to wear and tear, and their ability to function in harsh environments.
- However, chain drives also have some disadvantages, such as requiring regular maintenance, producing noise during operation, and requiring proper tensioning to prevent slippage and wear.
- Overall, chain drives are a reliable and widely used mechanism for transmitting power in a variety of industrial and mechanical applications.

SOFTWARE COMPONENT

6.1 Arduino UNO

Arduino Uno is an open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. It is designed for DIY electronics enthusiasts, hobbyists, and students who want to build interactive objects and projects.

The board has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a powerjack, an ICSP header, and a reset button. The board can be powered by either aUSB cable or an external power supply.

Arduino Uno is programmed using the Arduino Integrated Development Environment (IDE), which is a cross-platform application that allows users to write, compile, and upload code to the board. The code can be written in C or C++ programming languages and is based on a simplified version of the Wiring framework.

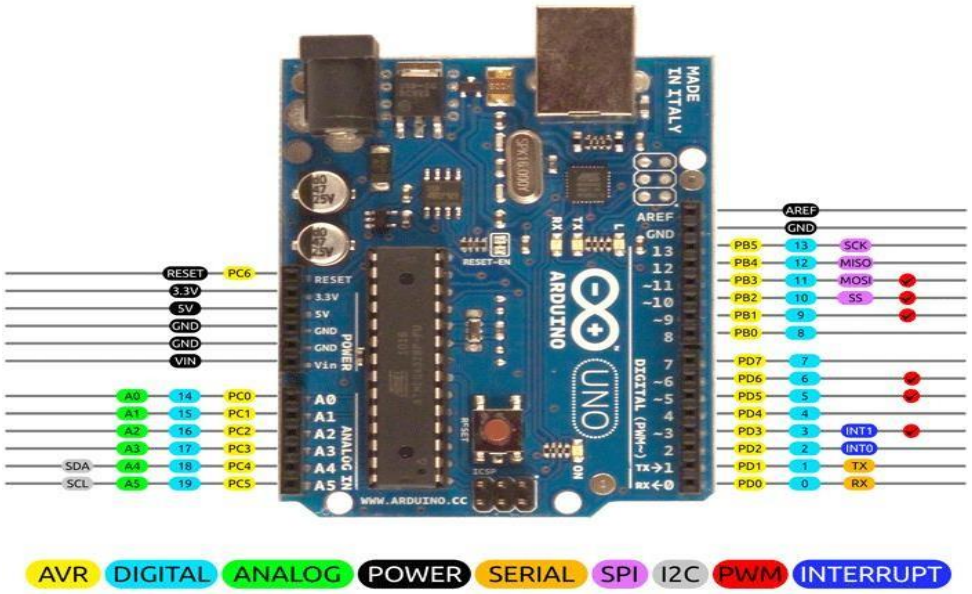


Fig. Arduino UNO

Pin Category	Pin Name	Details
Power	Vin, 3.3V, 5V, GND	Vin: Input voltage to Arduino when using an external power source. 5V: Regulated power supply used to power microcontroller and other components on the board. 3.3V: 3.3V supply generated by on-board voltageregulator. Maximum current draw is 50mA. GND: ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	A0 – A5	Used to provide analog input in the range of 0-5V
Input/Output Pins	Digital Pins 0 - 13	Can be used as input or output pins.
Serial	0(Rx), 1(Tx)	Used to receive and transmit TTL serial data.
External Interrupts	2, 3	To trigger an interrupt.
PWM	3, 5, 6, 9, 11	Provides 8-bit PWM output.
SPI	10 (SS), 11(MOSI) 12(MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	13	To turn on the inbuilt LED.
TWI	A4 (SDA), A5 (SCA)	Used for TWI communicate on.

Arduino Uno Technical Specifications

Microcontroller	ATmega328P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB
EEPROM	1 KB
Frequency (Clock Speed)	16 MHz

CHAPTER 7

CIRCUIT DIAGRAM

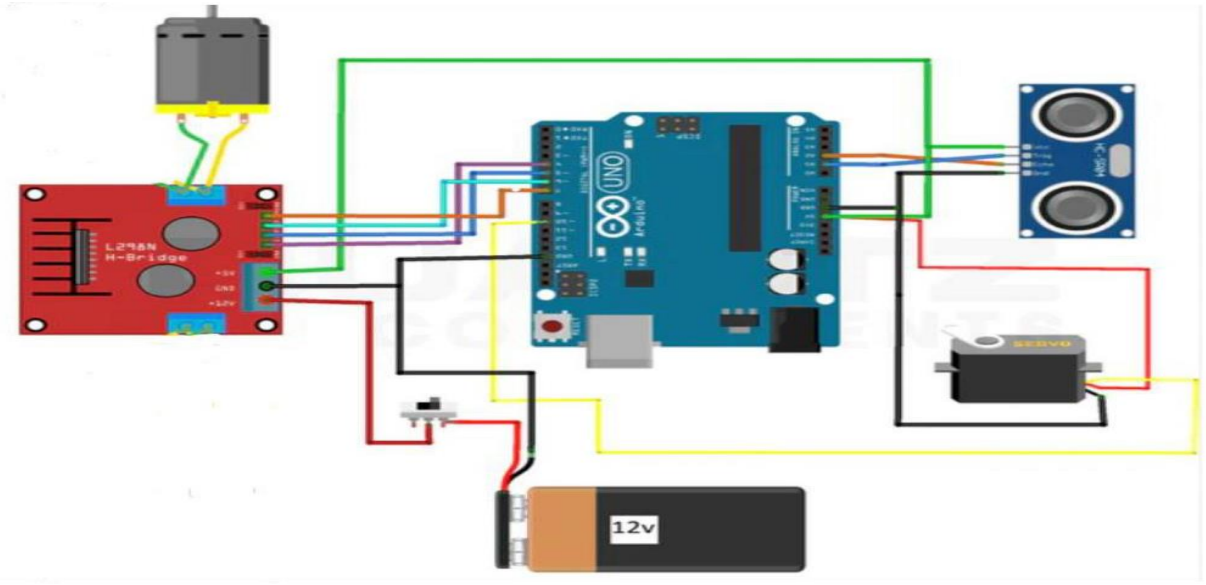


Figure : Circuit Diagram of Automatic Braking System

1. Ultrasonic sensors
2. DC gear motor
3. Servo motor driver
4. Arduino Uno
5. Jumper wires
6. Power supply

Once you have gathered all the required components, you can proceed with the following steps to perform the experiment:

- Connect the ultrasonic sensors to the Arduino Uno using jumper wires.
- Make sure to connect the VCC pin to 5V, GND pin to GND, Trig pin to digital pin 9, and Echo pin todigital pin 10.
- Connect the servo motor driver to the Arduino Uno using jumper wires.
- Connectthe VCC pin to 5V, GND pin to GND, IN1 pin to digital pin 2, and IN2 pin to digital pin 3.
- Connect the DC gear motor to the servo motor driver.
- Connect the positive wire of the DC gear motor to the M+ pin of the motor driver and the negative wire to the M-pin.
- Power up the circuit using a power supply.
- Upload the code to the Arduino Uno.
- The code should read the distance from the ultrasonic sensors, and if the distance is less than a certain threshold value, it should send a signal to the servo motor driver to activate the DC gear motor, which will applythe brakes when necessary.

CHAPTER 8

WORKING

An automatic braking system using ultrasonic sensors, DC gear motor, servo motor , and Arduino Uno can be implemented as follows:-

- Ultrasonic Sensors: Ultrasonic sensors are used to detect the proximity of objects. They emit high frequency sound waves and measure the time taken for the sound waves to bounce back after hitting an object. These sensors are used to detect the presence of an obstacle in front of the vehicle.

- DC Gear Motor: The DC gear motor is used to control the braking mechanism. When the ultrasonic sensors detect an obstacle in front of the vehicle, the DC gear motor is activated to apply the brakes.

- Servo Motor and Motor Driver: The servo motor driver is used to control the movement of the DC gear motor. The driver receives the input from the Arduino Uno and sends a signal to the servo motor to rotate the DC gear motor in the desired direction.

- Arduino Uno: The Arduino Uno is the brain of the automatic braking system. It receives the input from the ultrasonic sensors and processes it to determine whether the vehicle needs to be stopped. The Arduino Uno also sends the control signal to the servo motor driver to activate the DC gear motor.

The ultrasonic sensors are mounted on the front of the vehicle and continuously monitor the distance between the vehicle and any obstacle in its path.

When the ultrasonic sensors detect an obstacle within a certain range, they send a signal to the Arduino Uno The Arduino Uno processes the signal and determines whether the vehicle needs to Be stopped.

If the Arduino Uno determines that the vehicle needs to be stopped, it sends a signal to the servo motor driver. The servo motor driver receives the signal and activates the servo motor to rotate the DC gear motor in the direction of the braking mechanism.

The DC gear motor applies the brakes, and the vehicle comes to a stop. Once the obstacle is removed or the vehicle is moved away from the obstacle, the braking mechanism is released, and the vehicle can resume its motion.

In summary, the automatic braking system using ultrasonic sensors, DC gear motor, servo motor driver, and Arduino Uno is designed to detect obstacles in front of a vehicle and apply the brakes when necessary to prevent accidents

Each car maker has its own automatic braking system technology, but all of them believe some sort of sensor input. The ultrasonic sensor contains transmitter and receiver units, and the ultrasonic transmitter detects the obstacle by transmitting the signals and reflects back to the ultrasonic receiver unit. The ultrasonic sensor input is then used to determine if there are any objects present in the path of the vehicle. If an object is detected, the system can then determine if the speed of the vehicle is bigger than the speed of the thing ahead of it.

The ultrasonic sensor is used to detect an obstacle or an object in the path of the vehicle. The sensor sends out ultrasonic waves which bounce off the object and are received back by the sensor. The time taken for the waves to return is used to calculate the distance between the sensor and the object.

The Arduino Uno receives the distance information from the sensor and sends signals to the L298N motor driver. The motor driver controls the DC motor, which is attached to the wheels of the vehicle. When an obstacle is detected, the motor driver applies the brakes by stopping the DC motor. The servo motor is used to control brake lever . The servo motor receives signals from the Arduino Uno to control the brake lever .The DC gear motor rotates uniformly at a set rpm and gradually decreases speed while automatically breaking the system through servomotor braking mechanism phenomena.

CHAPTER 9

EXPERIENTATION

Automatic braking systems (ABS) have been around for several years, and they are designed to enhance the safety of vehicles by preventing collisions. To experiment with an ABS, you would typically need to have access to a vehicle equipped with this technology, or work with a team of engineers who are developing an ABS system. Here are some steps that might be involved in experimenting with an ABS:

- Obtain a vehicle equipped with ABS: To test an ABS, you would need access to a vehicle that is equipped with this technology. This could be a new car or truck that comes with ABS as standard equipment, or you may need to retrofit an older vehicle with an ABS system.

- Identify the testing environment: You'll need to choose a testing environment that provides a controlled and safe space to conduct your experiments. This could be a private testing facility, such as a closed track, or a closed-off section of a public road that has been cleared of other traffic.

- Define your experiment parameters: You'll need to define the parameters of your experiment, including the speed of the vehicle, the distance to the obstacle, and the response time of the ABS system. You may also want to consider testing the system under different weather conditions, such as rain, snow, or ice.

- Conduct the experiments: With the testing environment and experiment parameters defined, you can begin running tests on the ABS system. You'll want to document the results of each test and compare them to a control group that does not have ABS.

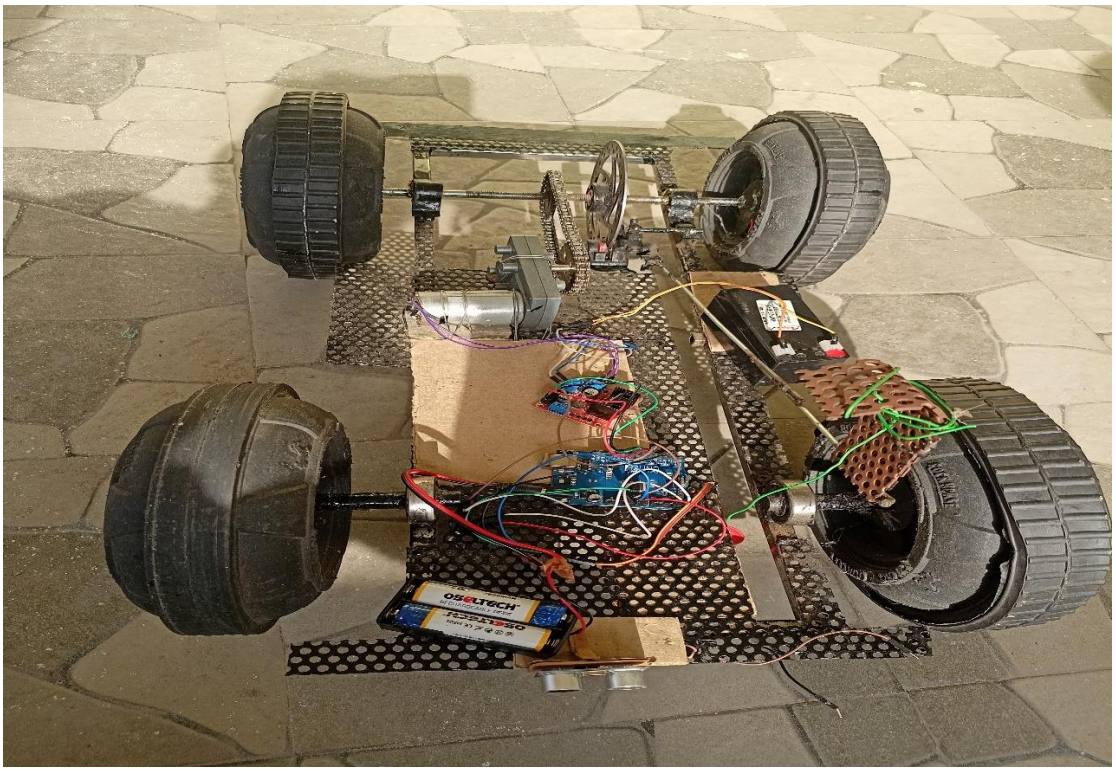
- Analyse the results: Once you have conducted your experiments, you'll need to analyse the results to determine the effectiveness of the ABS system. This might involve statistical analysis of the data collected during testing, as well as visual observations of the vehicle's performance.

- Make adjustments and repeat: If the results of your experiments suggest that the ABS system is not performing as desired, you may need to make adjustments to the system and repeat the experiments to test the effectiveness of these changes.

CHAPTER 10

RESULT

Project Photo:



Code:

```
#include <Servo.h>

// Motor Driver Pins
const int IN1 = 10;
const int IN2 = 9;
const int IN3 = 8;
const int IN4 = 7;

// Ultrasonic Sensor Pins
const int trigPin = A4;
const int echoPin = A5;

// Servo Motor Pin
const int ServoPin = 3;

// Create Servo object to control the servo motor Servo myservo;
```

```
void setup()
{
// Initialize the Motor Driver Pins
pinMode(IN1, OUTPUT);
pinMode(IN2, OUTPUT);
pinMode(IN3, INPUT);
pinMode(IN4, INPUT);

// Initialize the Ultrasonic Sensor Pins
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);

// Attach the Servo Motor to the ServoPin
myservo.attach(ServoPin);
}

void loop() {
// Read the distance from the Ultrasonic Sensor
long duration, distance;
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(1);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance = duration * 0.020 / 2;

// Control the Servo Motor based on the distance
if (distance > 30)
{
myservo.write(90);
delay(500);
digitalWrite(IN1, LOW);
digitalWrite(IN2, HIGH);
digitalWrite(IN3, HIGH);
digitalWrite(IN4, LOW);
delay(1000);
} else if (distance > 50) {
myservo.write(45);
delay(500);
digitalWrite(IN1, HIGH);
digitalWrite(IN2, LOW);
digitalWrite(IN3, HIGH);
digitalWrite(IN4, LOW);
delay(500);
} else {
myservo.write(0);
delay(500);
digitalWrite(IN1, HIGH);
digitalWrite(IN2, HIGH);
```

```
digitalWrite(IN3, HIGH);
digitalWrite(IN4, HIGH);
delay(500);
myservo.write(0); //rotate servo to one end
delay(2000); //wait for 1 second
myservo.write(380); //rotate servo to the other end
delay(3000); //wait for 1 second
}
}
```

CHAPTER 11

Conclusion :

1. An automatic braking system is a critical safety feature that can help prevent accidents and collisions. By using sensors to detect objects in the surrounding environment and applying the brakes as necessary, an automatic braking system can provide an extra layer of protection for drivers and passengers.

2. In conclusion, the implementation of an automatic braking system can greatly improve road safety, especially in situations where human error or reaction time can lead to accidents. However, proper design, testing, and calibration are crucial to ensure the system functions correctly and reliably. Additionally, it's important to note that an automatic braking system should not be relied upon solely, and drivers should always maintain proper awareness and control of their vehicle.

3. In this project, we have successfully developed an automatic braking system using an ultrasonic sensor, an Arduino Uno, an L298N motor driver, a DC motor, and a servo motor. The system is able to detect an obstacle in the path of the vehicle and apply the brakes to prevent a collision. With further improvements, this system can be developed into a fully functional automatic braking system for vehicles.

4. An automatic braking system is a critical safety feature that can help prevent accidents and collisions. By using sensors to detect objects in the surrounding environment and applying the brakes as necessary, an automatic braking system can provide an extra layer of protection for drivers and passengers.

5. In conclusion, the implementation of an automatic braking system can greatly improve road safety, especially in situations where human error or reaction time can lead to accidents. However, proper design, testing, and calibration are crucial to ensure the system functions correctly and reliably. Additionally, it's important to note that an automatic braking system should not be relied upon solely, and drivers should always maintain proper awareness and control of their vehicle.

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Future scope :

The future scope of automatic braking systems is quite promising. As the world becomes increasingly focused on safety and accident prevention, there is a growing demand for technologies that can reduce the number of collisions on the road.

Automatic braking systems have already been shown to be highly effective in preventing accidents, and as the technology continues to improve, we can expect tosee even more advanced systems in the future.

One of the key areas of development for automatic braking systems is in the use of artificial intelligence and machine learning algorithms. These systems can use data from sensors and cameras to learn about different driving scenarios and make better decisions about when to engage the brakes. This can help to reduce false alarms and improve the accuracy of the system, making it even more effective in preventing accidents.

Another area of development for automatic braking systems is in the integration with other advanced safety features. For example, many modern cars already have lane departure warning systems and adaptive cruise control, which can be combined with automatic braking systems to provide a comprehensive safety package.

Overall, the future of automatic braking systems is very bright. As technology continues to advance, we can expect to see even more sophisticated systems thatare better at preventing accidents and keeping drivers and passengers safe on theroad

CAPTER 12

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