

# **REVERSE BRAKING SYSTEM IN HILL STATIONS**

Submitted in partial fulfilment of the requirements for the award of  
Bachelor of Engineering Degree in Mechanical Engineering

By

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**DEPARTMENT OF MECHANICAL ENGINEERING**

**SCHOOL OF MECHANICAL ENGINEERING**

**SATHYABAMA**

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

**Accredited with grade "A" by NAAC**

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# SATHYABAMA

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## DEPARTMENT OF MECHANICAL ENGINEERING

### BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of ASWIN KRISHNAN C (Reg. No. 38150702) and MANOJ KUMAR R (Reg. No. 38150705) who carried out the project entitled "**REVERSE BRAKING SYSTEM IN HILL STATIONS**" under our supervision from 2018 to 2022.

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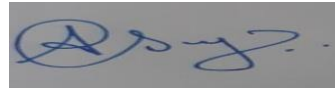
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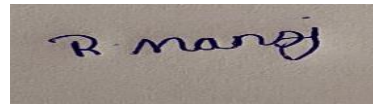
## DECLARATION

We ASWIN KRISHNAN C (Reg. No. 38150702) and MANOJ KUMAR R (Reg. No. 38150705) hereby declare that the Project Report entitled “**REVERSE BRAKING SYSTEM IN HILL STATIONS**” done by us under the guidance of Mr. V. Jayaprakash, M.Tech., MIE., (Ph.D.), is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Mechanical Engineering.



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## **ABSTRACT**

In today's vehicle industry, safety is a major concern, and automation is the key to keeping the safety at our fingertips. In other words, even someone who is less experienced or skillful behind the wheel of a car may do so safely. It is highly likely that ineffective braking is to blame for a number of car accidents that result in catastrophic injuries. Between 20 and 30 percent of all work-related deaths and major injuries each year are caused by reversing vehicles. This is a scientifically proven fact. The car finally collides with the barrier behind it while the driver is parking or making a reverse turn since he or she cannot see what's behind them and how far they've gone. Currently, automobiles are equipped with an alarm system that sounds when the vehicle approaches too near to an object, alerting the driver to the danger. However, this function has caused a number of issues and is susceptible to human mistake. In order to make it more useful, we've modified the mechanism such that it automatically stops when an obstruction is nearby.

"Intelligent Reverse Braking System" is the name given to a control framework in light of an electronically controlled vehicle slowing mechanism. IR transmitter and collector circuit, control unit, and a pneumatic slowing mechanism contain a sensor-worked pneumatic brake. Utilizing an IR sensor, the boundary is recognized. In case of a block, the IR sensor recognizes it and conveys a message to the slowing mechanism. Using pneumatic brakes, the system is broken. As a result of this, the automobile stops on its own by detecting the object's distance.

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# CHAPTER 1

## INTRODUCTION

### 1.1 INTRODUCTION OF REVERSE BRAKING SYSTEM

Ratchet and Pawl mechanisms are used to stop the automobile from rolling backwards in this study. Front drive shaft ratchet and Pawl attached to the frame. When driving on a slope, the lever must move the pawl into contact with the ratchet. In this case, the pawl would prevent the ratchet from moving in a counterclockwise direction to the front wheel. The pawl engaged the ratchet while the car was in neutral position, preventing it from moving forward. It's the job of the IR TRANSMITTER circuit to transfer Infra-Red radiation. The Infra-Red rays were reflected if any obstructions were in the route they were travelling along. The circuit that receives the reflected Infra-Red photons is known as the "IR RECEIVER." It's the control signal that comes from the control circuit that is received by the IR receiver circuit. The solenoid valve is turned on by the control circuit. Compressed air flows into the Single Acting Pneumatic Cylinder via the solenoid valve when it is actuated. The Piston rod bar is moved by the compacted air in the pneumatic chamber. Guard is impelled when cylinder goes ahead. The piston action causes the wheel to be broken gradually or abruptly. The "FLOW CONTROL VALVE" adjusts the braking speed by varying the valve's position. A wide scope of businesses, from older style amble factories and coal mineshafts to state of the art machine shops and even space robot missions, have reaped the benefits of pneumatic technology. Technicians and engineers need to be familiar with pneumatic systems, air-operated valves, and other pneumatic components. An air compressor compresses the air, and the compressed air travels via a piping system to the pneumatic cylinder from the compressor plant. Reduced pressure drop between compressed air production and consumption is essential for optimal pneumatic system performance.

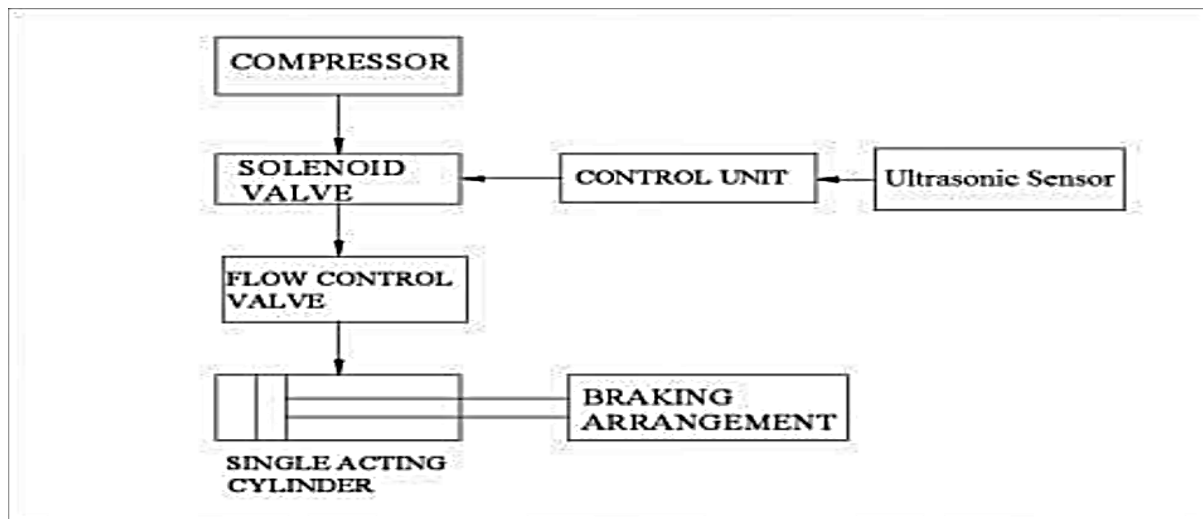
## 1.2 OBJECTIVE

- Create a prototype model to demonstrate the idea of an automated brake in a vehicle while travelling on a slope in mountainous terrain.
- To build a model of the same to demonstrate how emergency braking on slopes on a mountainous road works.
- To give alternatives for safety when operating a vehicle on a mountainous terrain
- To put the model to the test under various speed and slope situations.

## 1.3 METHODOLOGY

Ratchet and Pawl mechanisms are used to stop the automobile from rolling backwards in this study. Front drive shaft ratchet and Pawl attached to the frame. When driving on a slope, the lever must move the pawl into contact with the ratchet. In this case, the pawl would prevent the ratchet from moving in a counterclockwise direction to the front wheel. The pawl engaged the ratchet while the car was in neutral position, preventing it from moving forward. It's the job of the IR TRANSMITTER circuit to transfer Infra-Red radiation. The Infra-Red rays were reflected if any obstructions were in the route they were travelling along. The circuit that receives the reflected Infra-Red photons is known as the "IR RECEIVER." It's the control signal that comes from the control circuit that is received by the IR receiver circuit. The solenoid valve is turned on by the control circuit. Compressed air flows into the Single Acting Pneumatic Cylinder via the solenoid valve when it is actuated. The piston rod is moved by the compressed air in the pneumatic cylinder. Bumper is actuated when piston travels forward. The piston action causes the wheel to be broken gradually or abruptly. The "FLOWCONTROLVALVE" is used to regulate the braking speed. A wide range of industries, from old-fashioned lumber mills and coal mines to cutting-edge machine shops and even space robot missions, have reaped the benefits of pneumatic technology. Technicians and engineers need to be familiar with pneumatic systems, air-operated valves, and other pneumatic components. An air compressor compresses the air, and the compressed air travels via a piping system to the pneumatic cylinder from the compressor plant. Reduced

pressure drop between compressed air production and consumption is essential for optimal pneumatic system performance.



**Fig:1.1: circuit diagram modelling**

#### 1.4 PRINCIPAL COMPONENTS

- Sensor
- Transducer
- Operational Amplifier and ADC
- Braking Circuit
- DC Gear Motor
- Servomotor
- Ultrasonic Sensor

##### **1.4.1 Sensor**

Any device that detects changes in the surrounding environment and then reacts to an output from another system is called a sensor. An Analog voltage (or occasionally a digital signal) is turned into a human-readable display or conveyed for reading or further processing by a sensor.

In general, sensors are devices that detect a measuring object's feature amount and transform that quantity into a readable signal that may be shown on an instrument. Sensors come in different shapes and sizes and have several varieties.

#### **1.4.2 Transducer**

Any device that transforms one kind of energy into a readable signal is referred to as a transducer, for short. As a result, many transducers are capable of producing electrical signals that are proportionate to their inputs. Physical characteristics including energy, torque and light are among the most common inputs.

A transducer is an electronic device that converts energy from one form to another. Temperature and location sensors and antennae are a few common examples of the kind of devices that might be used as examples. ... When it comes to power conversion, there is no such thing as a completely efficient transducer.

#### **1.4.3 Ultrasonic sensor**

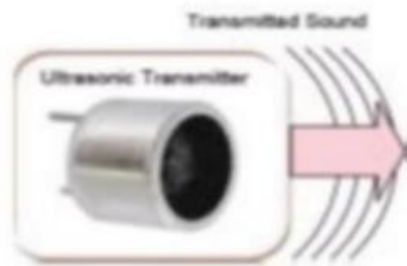
In order to determine a target object's distance, an ultrasonic sensor sends out ultrasonic sound waves, which are reflected back and converted into an electrical signal. Dissimilar to perceptible sound, ultrasonic waves move far faster (i.e., the sound that people can hear).

Because the duration of flight, rather than the sound strength, is used to measure the distance to an item, ultrasonic sensors are particularly good at suppressing outside interference. It doesn't matter what colour a material is, as long as it's reflective of sound.

Transmitter of ultrasonic waves

Before the ultrasonic wave is transmitted, there is an ultrasonic wave generator that generates ultrasonic wave. Intermittently delivering ultrasonic waves is made possible via the use of timing instructions. Ultrasonic wave generator will use this signal to generate ultrasonic waves in accordance with the instruction signal from the aforementioned timed instruction method (transform electrical energy into

sound wave). In order to locate an impediment on a roadway, an ultrasonic transmitter sends out ultrasonic waves. The range of ultrasonic sensors employed determines how far an impediment may be detected.



***Fig:1.2: Ultrasonic Transmitter***

Ultrasonic transducer The ultrasonic wave will create a reflected wave if it identifies an obstruction. The ultrasonic waves reflected from the street surface are gotten by a ultrasonic recipient and used to frame a gathering signal. It's possible to use an ultrasonic transducer to convert sound waves back into electrical energy. This signal is used to identify components of the amplified signal that have been distorted by roadside obstructions. Maintaining a steady ratio between reference signal and amplified signal's averages is achieved by controlling the amplitude of reference signal or amplification factor of amplifier.



***Fig:1.3: Ultrasonic Receiver***

#### **1.4.4 Operational amplifier and adc**

Functional enhancers, in some cases known as operation amps, are high-gain, differential voltage speakers with a sign result. There is a reversing and a non-transforming contribution to the enhancer's differential results. Just the 'differential information voltage,' the voltage contrast between the two data sources, is enhanced by the operation amp. The operation yield amp's voltage is balanced by sending a part of the result signal once again into the upsetting information. Negative feedback is what we call it. Because of the amplifier's high gain, only negative feedback can alter the output voltage for any given input.

#### **1.4.5 Braking circuit**

Each circuit functions on the two front wheels and one rear wheel in a standard dual-circuit braking system. In order to maintain the slave cylinders in good working order, the master cylinder features a reservoir that collects and stores brake.

#### **1.4.6 Dc motor**

Electrical motors that convert direct current electricity into mechanical energy are known as AD motors. The speed of an ADC engine might be differed over an enormous reach by modifying the power of the ongoing coursing through its field windings or by shifting the stockpile voltage.

Transports, turntables, and different gadgets requiring variable speed and consistent or low-speed force may all profit from DC engines. Dynamic braking and reversing are also frequent in industrial machinery, when they are effective.

#### **1.4.7 Servo motor**

Position feedback is used to regulate the motion and the end position of a servomotor. The result shaft position is addressed by a simple or advanced signal sent into the control framework.

Position input and speed criticism are given by means of the engine and an encoder. Just the area is estimated in the easiest model. The result's deliberate position is contrasted with the regulator's outside input, which is the order position. When the result shaft moves askew with the ideal position, a blunder signal is

delivered, which triggers pivot of the engine in one of two headings. The mistake signal abatements to nothing and the engine turns down when the areas are drawn nearer.

The simplest servomotors employ merely a potentiometer to sense position and a bang-bang controller to regulate the motor's speed (or is stopped). In industrial motion control, this sort of servomotor is uncommon, but it is the building block for many of the basic and inexpensive servos seen in radio-controlled models.

In more advanced servomotors, optical rotary encoders and variable-speed drives are used to measure the speed of the output shaft. A PID control method in conjunction with these two advancements allows the servomotor to be delivered to the desired position more rapidly and accurately, with less overshooting.

## 1.5 ADVANTAGES OF BRAKING SYSTEM

- Lower cost of brakes
- No need to make any adjustments for wear
- Lower utilization of electrical energy

There is no need for highly-trained experts to run the machinery.

- It provides a very straightforward method of use

## 1.6 FUNDAMENTALS OF SENSORS

In most cases, more than one sensor may be utilised to take a measurement for any given amount. It is important to note that each sensor type has varying degrees of accuracy, sensitivity, specificity and capacity to work in varied climatic and environmental situations. In addition, there is the issue of price. Sensors with more advanced features are usually more costly, but they often have higher performance qualities.

Rapid measurements need the use of smaller and more easily transportable devices, such as hand-held or disposable sensors. As with a blood glucose sensor, the sensor is often located close to where the sample is collected. In order to offer

advanced features like data processing, display, storage, and remote communication, these sensors are rapidly being combined with computational capabilities.

### **1.6.1 Ultrasonic sensor**

High-frequency sound waves are used by ultrasonic ranging and detection systems to identify the presence and range of an item. System measurements are based on whether the sound object's echoes are reflected or whether the sound beam is interrupted as it travels from transmitter to receiver.

It is common for ultrasonic sensors to use a transducer that responds to incoming ultrasonic energy with an electrical output. Human hearing spans a frequency range of between 20 to 20,000 hertz. Ultrasonic sound waves are sound waves that have a recurrence surpassing 20,000 hertz, which is above the range of human hearing. If the frequency of the sound is over 20,000 hertz, it is termed ultrasonic. Ultrasonic noise is generated by practically every source of friction in industrial operations.

The sensor distinguishes the time slipped by between the second the transmitter radiates sound and the sensor's contact with the collector to decide the distance between the two. Coming up next is the computation's recipe:

$$\mathbf{D = \frac{1}{2} T \times C}$$

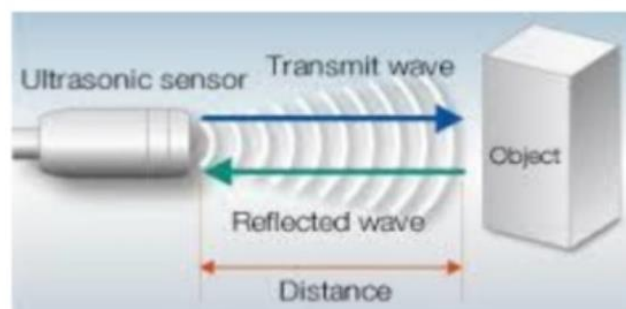
(Where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). A ultrasonic sensor pointed at a case, for instance, would require 0.025 seconds to return, demonstrating the distance between the sensor and box is:

$$\mathbf{D = 0.5 \times 0.025 \times 343}$$

or about 4.2875 meters.

As nearness sensors, ultrasonic sensors are most frequently utilized. Among them are self-leaving frameworks for cars and impact anticipation frameworks. Mechanical snag discovery frameworks and modern advancements additionally utilize ultrasonic sensors. Ultrasonic sensors are less helpless against impedance from smoke, gas, and other airborne particles contrasted with infrared (IR) sensors in vicinity location applications (however the actual parts are as yet impacted by factors like hotness).

Other than being utilized to distinguish, screen, and control fluid levels in open compartments, ultrasonic sensors may likewise be used as level sensors (such as vats in chemical factories). When it comes to creating pictures of the internal organs, identifying cancerous tumours, and monitoring the health of pregnant women, ultrasonic technology has been important.



***Fig:1.4: Ultrasonic Ranging***

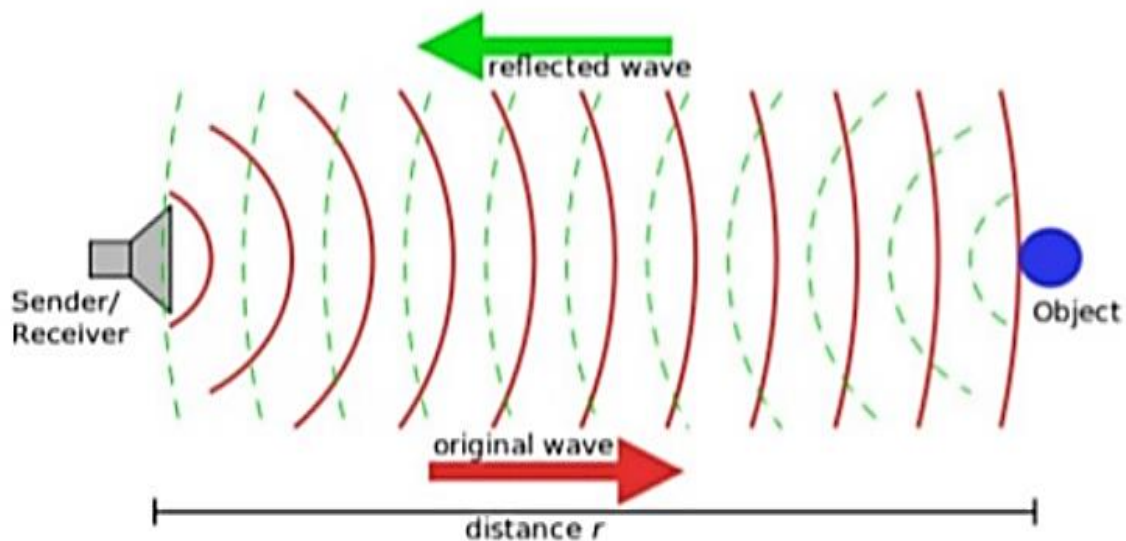
### ***1.6.2 Ultrasonic sensing and control***

Like sound waves, ultrasonic communications have frequencies that are significantly higher than those of audible sound. It is the piezoelectric gems in our ultrasonic transducers that resound to the right recurrence and convert electric to acoustic energy. Sound waves, which are produced as a cone, are reflected back to the transducer from an objective.

Even spherical items may be used as targets, as long as they have a shiny surface.

## 1.7 MEASUREMENT PRINCIPLE AND EFFECTIVE USE OF ULTRA SONIC SENSOR

The ultrasonic waves reflected from an item are sent from the sensor of an ultrasonic sensor. In general, the ultrasonic sensor ranges in our project are around 2 centimetres to 1 metre long.. The article's area not set in stone by estimating the time passed between the transmission and gathering of a sonic heartbeat. Using an ultrasonic transducer, you can generate ultrasonic signals. A similar transducer might be utilized to distinguish returning signs after the signs have been gone through the detecting medium. Air is often used as a sensing medium in most cases.



***Fig:1.5: Basic Ultrasonic operation***

## 1.8 The advantages of ultrasonic sensors

For real-world applications, ultrasonics provide several benefits. Ultrasonic sensors provide the following advantages:

- Moving objects may be recognised and quantified at discrete distances.
  - Less affected by target materials and surfaces, and not affected by variety.
- Strong state gadgets are almost support free and have a practically endless

life expectancy. Small things may be detected across vast distances using ultrasonic technology.

- It is capable of detecting and measuring the distance between it and moving objects.
- Allows for the detection of tiny items from a considerable distance away
- When it comes to dust, grime, and high-moisture, ultrasonic sensors are unaffected.

## 1.9 DISADVANTAGES OF ULTRASONIC SENSORS

Ultrasonic sensors have a few drawbacks, including:

- The energy of ultrasonic waves released from a wave emitter cannot be increased to a practical level if it becomes overheated.
- A road surface reflection cannot be distinguished from other types of reflections, such as those from buildings or trees.

## 1.10 TARGET ANGLE AND BEAM SPREAD

The 'tilt response' sensor is the subject of this phrase. Due to the fact that ultrasonic sound waves reflect off of targets, a particular sensor's tilt is considered tolerable.

When a round wand is passed across the target region, this word is specified as the area in which it will be detected. Immediately after it exits the transducer, ultrasonic sound spreads to its widest possible radius.

## 1.11 DC GEAR MOTOR

A gear dc motor may be thought of as an extension of the dc motor, and that's exactly what we've done in this article. A gear assembly is connected to a geared dc motor. RPM stands for revolutions per minute, which is the unit used to measure motor speed. Increased torque and reduced speed may be achieved with the aid of the gear assembly. A gear motor may be slowed down to any desired speed by using the suitable gear combination. Reducing vehicle speed while increasing torque

is referred to as gear reduction. The gear head and, by extension, the DC motor's operation, will be thoroughly examined in this insight.

The DC gear motor is sometimes referred to as a DC geared motor. an engine with a gearbox and a gear head Gearboxes or gear heads are used to drive the electric DC motor.

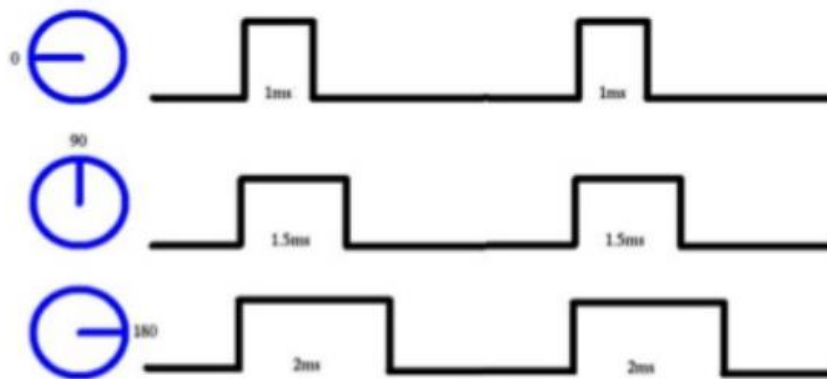
## 1.12 SERVO MOTOR OPERATION

Closed-loop servomechanisms, such as servo motors, employ position feedback to regulate their motion and ultimate position. A signal (digital or analogue) indicating the desired position of the output shaft is also used as an input to its control.

Some kind of encoder is used to monitor the motor's location and speed. The area is all we want to be aware experiencing the same thing. Subsequently, the result position is contrasted with the order position, which is the regulator's outside input. An error signal is generated if the output location varies from the anticipated output location. Accordingly, the engine turns in one or the other course to carry the result shaft to the ideal position. The blunder signal reductions to zero as the spot draws nearer. Finally, the engine comes to a complete halt.

A potentiometer and bang-bang control of the servomotor are the sole means of determining the position of a basic servomotor. To make matters worse, the engine is continually running at full power. Industrial motion control does not employ this sort of servomotor very often, but it is the foundation for basic and inexpensive radio control servos.

These motors also have use in optical rotational encoders and variable-speed drives for measuring and controlling motor speeds. Consolidating this with a PID calculation empowers the servomotor to be in its order position all the more rapidly and precisely with less overshooting.



**Fig:1.6: Servo Motor Movement Timing**

The angle of the output shaft is determined by the pulse's duration. Note that these are just examples of possible timings; real timings may vary depending on the particular motor manufacturer. However, the underlying idea remains the same.

### 1.13 ARDUINO UNO

Arduino Uno is an ATmega328-based microcontroller board. With 20 computerized input/output pins, a 16 MHz resonator, a USB association, a power connector, an in-circuit framework programming header, and a reset button, it could be utilized as both a PWM yield and a simple information gadget. It accompanies all that you really want to begin with the microcontroller, including a USB association and an AC to DC converter or battery.

Dissimilar to every single past board, the Uno doesn't utilize the FTDI USB-to-serial driver chip as does the Arduino Micro. In place of a USB-to-serial converter, an ATmega16U2 is used. An innovative USB bootloader is included with this supplementary microcontroller, making it easy to programme.

A vast library of support libraries and hardware add-ons make the Arduino an excellent platform for learning embedded electronics. It's worth noting that we

also have an Arduino Uno and other components (such as breadboard, sensors and jumper wires) that may be used to produce a variety of interesting basic projects.

It has a total of 14 I/O pins. This means that 6-pins may be used as PWM outputs by connecting them to these pins. An RST button and 14 digital input/output pins are included on this board, as well as a USB connection, an analogue input of six, and a RST button.

An outside power source or a USB association might be utilized to drive the Arduino. Battery or AC to DC converter are the primary components of an external power source, which ranges in voltage from 6 to 20 volts. A 2.1mm plug may be used to connect an adapter to the power connector on the motherboard. Vin and GND pins may be used to connect the battery connections.

## CHAPTER 2

### LITERATURE SURVEY

#### 2.1 INTRODUCTION

The car braking system is very important, there is major research and new inventions came in a collision and avoidance earlier braking systems, they also used cameras to make the system difficult, we focused on this area and came up with the idea that rear channel and obstacle sensor uses an ultrasonic sensor so the ultrasonic sensor detects channels, structural holes and unconditional road imbalances automatically apply the brakes and save the car and its life. It is also important to add a safety device on the rear side of the car also, this program can be selected on all motor vehicles

#### 2.2 LITERATURE SURVEY

**Arun Kumar et.al. (2014) [1]** Currently, the work is focused on character development and behavioural testing of flax-epoxy compounds. The capacity to forecast long-term structures and gauge a material's long-term efficacy and durability is made possible by a greater knowledge of these behaviours. There are several applications for tension-tension fibre composites, and this study aims to examine the exhaustion behaviour of one random fibre, six different textile structures, and two different laminate combinations. Fatigue behaviour is strongly influenced by the structure of the fibres, with high static energy and modulus combinations producing the optimum fatigue characteristics.

**Dhanya et.al. (2012) [2]** VHDL created the auto-braking mechanism to maintain a set distance. A clever pre-collision smart security system is provided. Using a sensor, this module can measure the distance between your car and the one in front of it, and if the driver doesn't slow down, it will apply the brakes automatically. Your car's speed and the distance between it and the next closest vehicle are shown by the system. The system ran well.

**Eung Soo Kim et.al. (2009) [3]** In order to reduce car crashes in the back, it is important to judge the need for emergency evacuation as soon as possible and start assistance naturally. On the other hand, we obtained a mathematical model of driver sensitivity of proximity to the vehicle following the condition and a proven model of successful driver slowing down to define speed-reduction patterns and braking time for a professional driver. In this study, an automatic brake system will be proposed to avoid collisions based on the profile of the brake profile and the brakes of the professional driver's brakes for smooth, environmentally friendly brake assistance. It will be shown that the proposed control method can produce a smooth profile in a variety of contexts.

**Mohd.Shahrizan et.al. (2013) [4]** Ultrasonic waves are discharged from a ultrasonic wave producer mounted on the facade of a separable brake vehicle and coordinated at a foreordained distance before the vehicle by the ultrasonic wave vehicle slowing mechanism. The front of the car is outfitted with a ultrasonic beneficiary, which is initiated by getting a presentation of the ultrasonic wave signal as shown by the hindrances laid out inside the pre-decided distance before the vehicle for mechanized slowing down.

**Sairam et.al. (2013) [10]** Nowadays, sophisticated safety features are often placed in automobiles to lessen the danger of accidents, many of which occur in cities. ABS, traction control, and stability management are the three most prevalent braking systems. They all monitor the vehicle's state and react in an emergency using several sorts of sensors at all times. In this work, the speed of the automobile being monitored by ultrasonic sensors is increased for safety purposes.

**Raja Kumar et.al (2014) [9]** Plastic is increasingly being used to replace metal components in automobiles, mostly in an effort to decrease weight and cost. There are a number of components. This can be achieved mainly by replacing the metal part and the injection moulded parts. Ours The study is related to the use of mild simulations as an example of the conversion of metal to plastic cooler in a cooling part of a piston motor. A Nylon66 + 30GF piston cooling nozzle is used instead of the aluminium piston cooling nozzle. The pipe's mouthpiece or nozzle. From the end product's construction, a partial hand injection mild was planned and built. Finally, the plastic component should be put through its paces to see how well

it performs under real-world settings and how it stacks up against the aluminium component.

**Ramamoorthy et.al (2017) [7]** This article focuses on structures built with special materials have a small impact on pollution. Research has been done on a variety of topics mixtures, building materials and chemicals provide an effective construction method in the area future generations. These mixtures and building materials are tested and proven to be so energy saving, water conservation, pollution, low maintenance and waste minimization. I the main idea is to make the project worthwhile to make the environment clean at a cost an effective route where the city is facing severe pollution

**Praveen et.al (2014) [6]** Plastic is increasingly being used to replace metal components in automobiles, mostly in an effort to decrease weight and cost. There are a number of components. For this, the metal portion and the injection moulded pieces may be replaced. Ours The study is related to the use of mold simulations as an example of the conversion of metal to plastic cooler in a cooling part of a piston motor. Nylon66 + 30GF piston cooling replaces the aluminium piston cooling nozzle in this instance. Pipe's mouth

**Srinivasan et.al (2013) [11]** Hydrostatic bearing finds widespread use in various machine tools due to its high durability and durability. The aping function Low and/or high temperatures, dust and grime, humidity, and unusual mounting circumstances are all examples of environmental factors that might affect a bearing's performance. Because of this, bearing selection and performance may be affected by both mechanical and environmental conditions. Rotational lubricant inertia must be considered in the design of high-speed applications. It is the goal of this research to develop a hydrostatic bear with high durability, a mitigation factor, and lubricating inertia.

**Srinivasan et.al (2014) [12]** Plastic is increasingly being used to replace metal components in automobiles, mostly in an effort to decrease weight and cost. There are a number of components. For this, the metal portion and the injection moulded pieces may be replaced. Ours Studying how mould simulations may help with piston motor coolers that are made of metal instead of plastic has been the

focus of this research. Nylon66 + 30GF piston cooling replaces the aluminium piston cooling nozzle in this instance. The pipe's mouth.

**Ramamoorthy et.al (2017) [8]** In the current context due to urban growth it raises the issue of land use problematic through construction activities. It is therefore necessary to stabilize the soil and improve the bearing soil capacity for construction purposes. Use of fibre in the soil for improvement buildings are one of the latest, as they are advantageous because they are cheaper, locally available, rotten and eco-friendly. In this study an inert material, polypropylene used to develop world engineering buildings. To study the effect of polypropylene fibre in the earth's crust, a California Bearing Ratio (CBR) test is performed. It Isan important soil parameter for designing flexible pavements and wind pathway.

## CHAPTER 3

### AIM AND SCOPE

#### 3.1 AIM OF THE PROJECT

Vehicles slide backwards when halted in sloppy sections of a hill station. Accidents and property damage may result from rolling back vehicles slamming into the car in front of them.

A car exiting a parking lot at a mall may experience a 45-degree incline on its path. Because of the car in front of you, a restriction is placed on the clutch and brakes. In spite of this, the car continues to go ahead while also rolling backward.

#### 3.2 SCOPE OF THE PROJECT

When driving on a typical surface, releasing the clutch and letting off of the gas pedal is all that's needed to get the car moving ahead with little to no acceleration. If you're going downhill, zero or little acceleration isn't enough, thus the car goes backward.

## CHAPTER 4

### MATERIALS AND METHODS

#### 4.1 Sensing and controlling unit

To lay it out plainly, the sensor and control unit distinguishes a thing before the vehicle, measures distance and speed as it approaches, and afterward conveys the fitting messages to the servo engine and, at last, the independent stopping mechanism. Arduino is the system's microprocessor, while a servo motor, ultrasonic transducer, and power supply power it.

#### 4.2 COMPONENTS OF SENSING AND CONTROLLING UNIT (SCU)

##### **4.2.1 *Arduino uno r3***

In light of Mega38P, the uno is the microcontroller board. 14 advanced in/out pins, 6 simple information sources, a 16MHz quartz precious stone, a USB association, a power plug, and both an ICSP header and a reset button are completely remembered for this gadget.

Basically interface it to a PC with a usb association or power it with an air conditioner to dc converter or battery to get everything rolling with the miniature regulator. Using your UNO, you don't have to worry about doing anything incorrectly, since you can always buy a new chip and start again.

The Arduino's construction is also a drawback. You must keep the size of a project as modest as feasible when creating it.

However, due to Arduino's large architecture, we must continue to use large PCBs. If you're dealing with a microcontroller like the ATmega8 you may quickly reduce the size of your PCB.



**Fig:4.1: Arduino Uno Layout**

Table 4.1: Technical Specification of Arduino UNO

|              |                       |
|--------------|-----------------------|
| Brand name   | Arduino               |
| Height       | 25 Millimetres        |
| Width        | 5.5 Centimetres       |
| Weight       | 91 grams              |
| Dimensions   | 8*5.5*2.5 Centimetres |
| RAM size     | 8kb                   |
| Voltage      | 5 volts               |
| Digital pins | 14                    |

USB power or an external power source are also options for powering the Arduino uno board. An auto-selector determines the best power supply for your device. An AC-to-DC converter or a battery might give outer (non-USB) power. A 2.1mm focus positive connector might be utilized to associate the connector to the board's power

port. The POWER connector's GND and VIN pin headers acknowledge battery leads.

Utilizing an outer wellspring of 6 to 20 volts, the board can run. The 5v pin might give under five volts in the event that it is provided with under 7v, and the board might become unsound subsequently. Overloading the voltage regulator with more than 12 volts might harm the circuit board. A voltage range of 7 to 12 volts is suggested.

The following are the connections for the power supply:

- VIN: the Arduino board's input voltage when powered by an external power supply. This pin may be used to deliver electricity or, if using the power jack, to access it.
- The microchip and different parts on the board are fueled by a controlled 5V power source. VIN can give this through an on-board controller, or USB or one more directed 5v inventory can give this.
- An on-regulator-generated 3.3-volt supply. Maximum power consumption is limited to 50 milliamps (mah).

The GND pins are used for grounding purposes.

- On the uno, all 14 digital pins may be utilised for input or output. In order for them to work, you'll need 5 volts. Each pin contains a 20-50 k-ohm internal pull-up resistor and is capable of delivering or receiving up to 40ma. Some pins, on the other hand, are used for specific purposes.
- 2. and 3. Interrupts from other sources. An interrupt may be set up on a low valve using these pins. Details may be found in the functions that follow.

#### **4.2.2 Ultrasonic transducer**

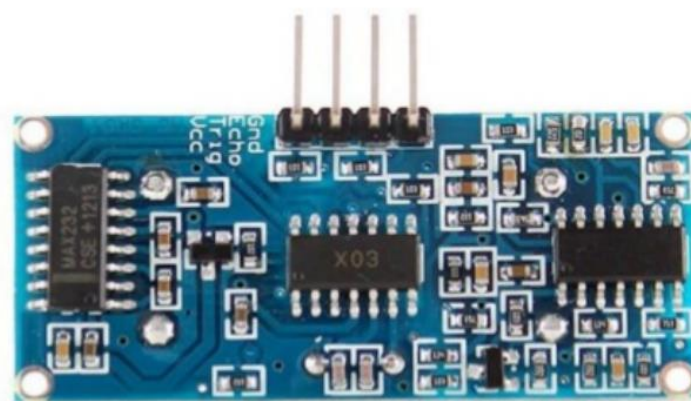
As the name suggests, it is a device that converts a different form of energy into an ultrasonic one. There are a number of fundamental varieties, categorised by the source of the energy and the medium in which the waves are formed. Pneumatic or gas-powered transducers may be found in mechanical devices as well

Ultrasonic transducers, like radar and sonar, are utilised in systems that use reflected signals to analyse objects. If, for example, you send out a signal and get an echo, you may determine the object's distance. Under the case of passive ultrasonic sensors, microphones are used to detect ultrasonic sounds in particular circumstances.

If a transducer is being used for medical diagnostic purposes, such as the range-finding applications listed above, it is likely to have a lower power output than a transducer that is being used for chemical, biological or physical (e.g., erosive) effects on a liquid medium or a target that is immersed in that medium. Ultrasonic tests and showers, which utilize ultrasonic energy to shake particles, clean, disintegrate, or upset organic cells in an assortment of materials, are remembered for the last class too.

Because of the piezoelectric impact, piezoelectric materials may likewise be utilized as ultrasonic locators. It is feasible to have a piezoelectric handset that performs both the jobs of a transmitter and a recipient. Transmission of sound waves is not limited to piezoelectric mechanisms. Instances of this incorporate magnetostriction. When exposed to an attractive field, materials having this component contract or extend fairly in size, making them ideal for use as transducers.

The diaphragm of a capacitor microphone (also known as a condenser microphone) reacts to ultrasonic waves. Sound signs are changed over into electric flows by the stomach and a firmly dispersed support plate, which might be intensified.



***Fig:4.2: Ultrasonic Transducer HC-SR04***

Table 4.2: Specification of ultrasonic transducer

|                      |                                                    |
|----------------------|----------------------------------------------------|
| Working Voltage      | DC 5v                                              |
| Working Current      | 15 mA                                              |
| Working Frequency    | 40Hz                                               |
| Max Range            | 4m                                                 |
| Min Range            | 2cm                                                |
| Measuring Angle      | 15 degrees                                         |
| Trigger Input Signal | 10uS TTL pulse                                     |
| Echo Output Signal   | Input TTL lever signal and the range in proportion |
| Dimension            | 45*20*15mm                                         |

Directly connecting the wires:

- 5V power supply
- Input of a trigger pulse
- Echo pulsing

The HC-SR04 ultrasonic going module has a scope of 2cm-400cm and a running exactness of 3mm. The ultrasonic transmitter, collector, and control hardware are completely remembered for the module.

This is the foundational tenet of the job:

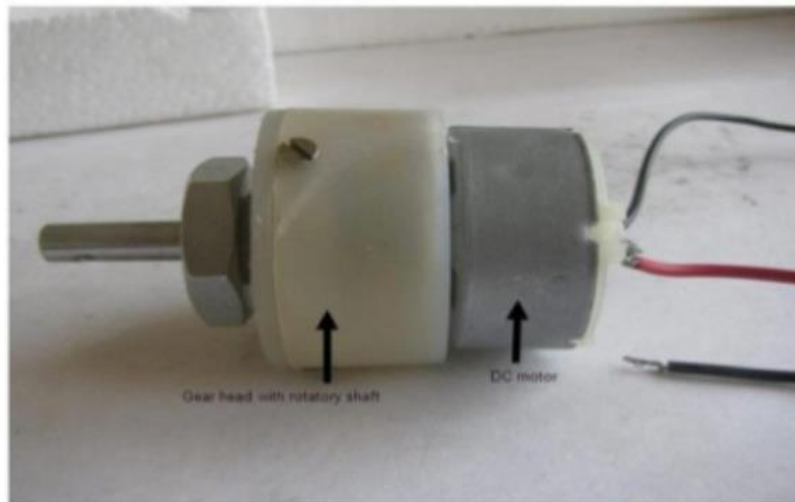
- At least a 10us high-level signal is required when using an IO trigger.
- Sends eight 40 khz pulses and checks to see whether there's a pulse response.

Sending and receiving ultrasonic signals at a high level requires a long period of high output Io duration. Sound velocity (340M/S) divided by test distance equals high level time.

### ***4.2.3 Dc gear motor***

Electrical motors that convert direct current electricity into mechanical energy are known as ADC motors. The most popular varieties depend on magnetic fields to generate the forces needed to operate. Most DC engines include an electromechanical or electronic inside system for redirecting current in a piece of the engine on an intermittent premise.

At first, DC engines were regularly utilized on the grounds that they could be driven by direct-current lighting power conveyance frameworks. It is feasible to modify the speed of a DC engine across a huge reach by differing the inventory voltage or the force of current in the field windings. There are a few applications for little DC engines, including toys and machines. The widespread engine can run on direct current, but it is a low weight brushed engine utilized for convenient power apparatuses and machines. Electric vehicles, lifts and derricks, and steel moving factory drives are generally as of now controlled by bigger DC engines. Ac motors have replaced DC motors in numerous applications since the introduction of electricity.



***Fig:4.3: DC Gear Motor***

Table 4.3: Specification of DC Gear Motor

|                |         |
|----------------|---------|
| Length         | 80mm    |
| Volts          | 12v     |
| Stall Torque   | 12kg-cm |
| Speed          | 100rpm  |
| Shaft Diameter | 6mm     |
| Weight         | 281g    |

#### **4.2.4 Servo motor**

To direct its movement and extreme position, a servomotor utilizes position input. The result shaft position is addressed by a simple or advanced signal sent into the control framework.

Position and speed are imparted to the client through a position encoder connected to the engine. Just the area is estimated in the easiest model. The result's deliberate position is contrasted with the regulator's outside input, which is the order position. Upon receiving an error signal indicating that the output position is out of alignment with the desired one, the motor will begin to spin in the opposite direction to correct the problem. The error signal decreases to zero and the motor shuts off when the locations are approached.

A potentiometer and bang control of the motor are used in the most basic servomotors, which always operate at maximum speed (or is stopped). However, it is the foundation for the simple and inexpensive servos seen in radio-controlled models, even if they are not often utilised in industrial motion control.

In more advanced servomotors, optical rotary encoders and variable-speed drives are used to measure the speed of the output shaft. In conjunction with a PID control method, both of these improvements help the servomotor reach its desired position more quickly and accurately, resulting in reduced overshooting.

Servomotor SG 90's output shaft can rotate around 180 degrees. The primary output gear of a typical servomotor has a mechanical stop built into it, which limits the motor's ability to turn beyond a range of 0 to 180 degrees. Servomotor output shaft angle is governed by the type of the PIC microcontroller input signal to the servomotor. Due to the 180-degree rotation of the servomotor, the braking mechanism may be applied and released.



***Fig:4.4: Servomotor***

Table 4.4: Specification of Servomotor

|                   |                        |
|-------------------|------------------------|
| Weight            | 9 grams                |
| Gear Type         | Plastic                |
| Operating Speed   | 0.12 seconds/60 degree |
| Operating Voltage | (3.0-7.2) V            |
| Angle of Rotation | (0-180) degrees        |

### 4.3 WORKING

To stop the automobile from rolling backward, a Ratchet and Pawl device was developed. Front drive shaft and the Pawl are equipped with ratcheting mechanism. It is necessary for the lever to contact the ratchet while the car is being driven on a hillside. The pawl would prevent the ratchet from moving Counter Clock-wise with regard to the front wheel if the vehicle is moving in the other direction.

The pawl engaged the ratchet while the car was in neutral position, preventing it from moving backward. Because of this, there is no need to use the hand brakes. When the car is moving, the ratchet and pawl are no longer engaged. V.DESIGN OF RATCHET AND PAWL

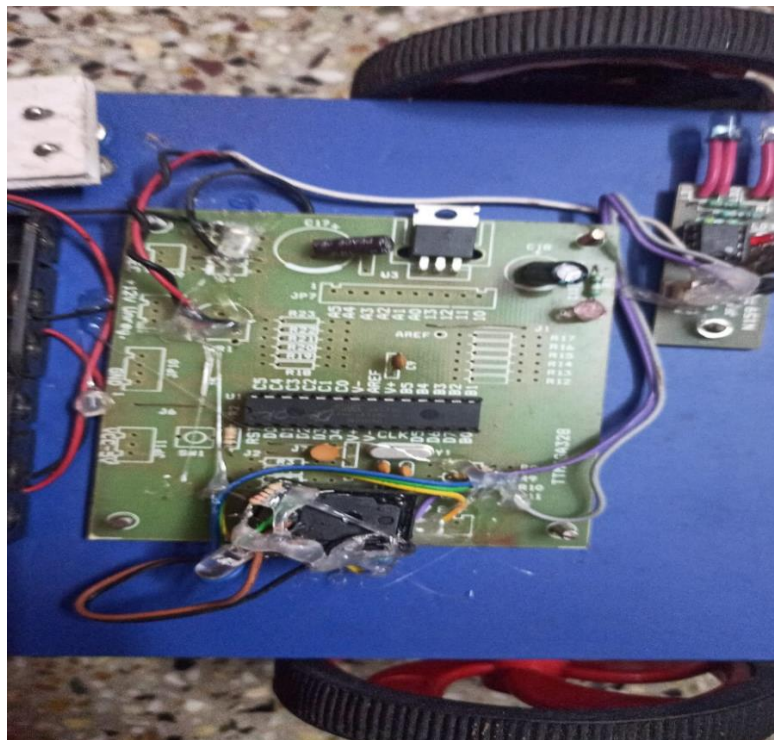
Maruthi Swift DZIRE-specific loading requirements dictate the design of the mechanism. The diameter of this car's front drive shaft has been confirmed to be 23.89mm. The MARUTI SWIFT DZIRE automobile has a weight of 1060 kg and a torque of 190 Nm. SLOPE OF THE ROAD: ZOJI PASS in KASHMIR is the steepest road in India, with an angle of inclination of 21.80 degrees. There is a 40% incline in that area. Gray cast iron and C45 are the materials under consideration for ratchets and pawls, respectively. Surfaces on both sides are regarded to be impenetrable. It is presumed that there are 12 teeth on the ratchet wheel. For the design of the mechanism, the following factors are taken into account.

To verify experimentally whether functionality has been attained, the fabricated Ratchet and Pawl mechanism is mounted on a driving shaft. The pawl does not stop the ratchet from rotating when the lever is moved in the forward direction, like the forward motion of the automobile. The pawl prevents the rotation of the ratchet when the hand lever is moved in the opposite direction of the reverse motion of the automobile on the hill road. As a result, neither the drive shaft nor the wheels were turning. As a result, the wheels' backward motion is halted. If this model is installed in the vehicle, the same results may be accomplished. This will be the situation when the car's drive shaft is being fitted with this system.

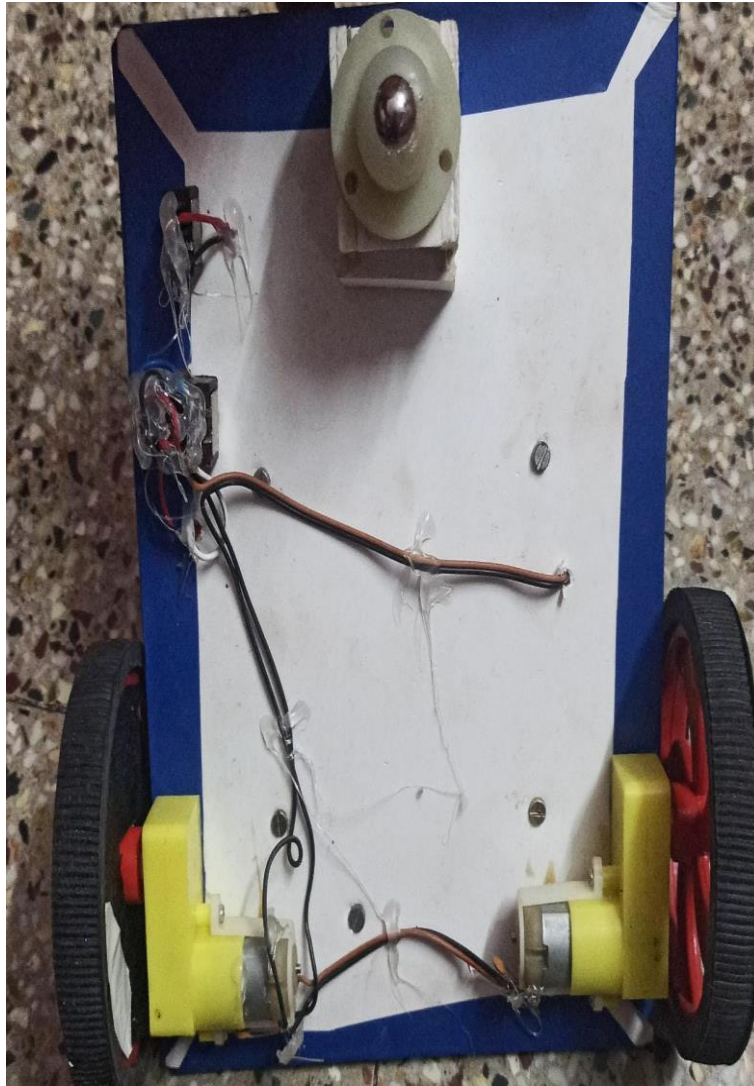
Once the pawl locks the ratchet, the automobile will not be able to reverse down the hill.

#### 4.4 RESEARCHGAP

Another downside is that the car is only held in place for two to three seconds when using hillholder mechanisms. The driver must remain vigilant despite the fact that the vehicle is designed to resist rolling back. This isn't the only drawback of the system. The following issues arise for the driver while navigating hilly terrain in a vehicle equipped with a hillholder mechanism: The brake clutch and accelerator are two common areas where drivers have trouble, according to the survey.



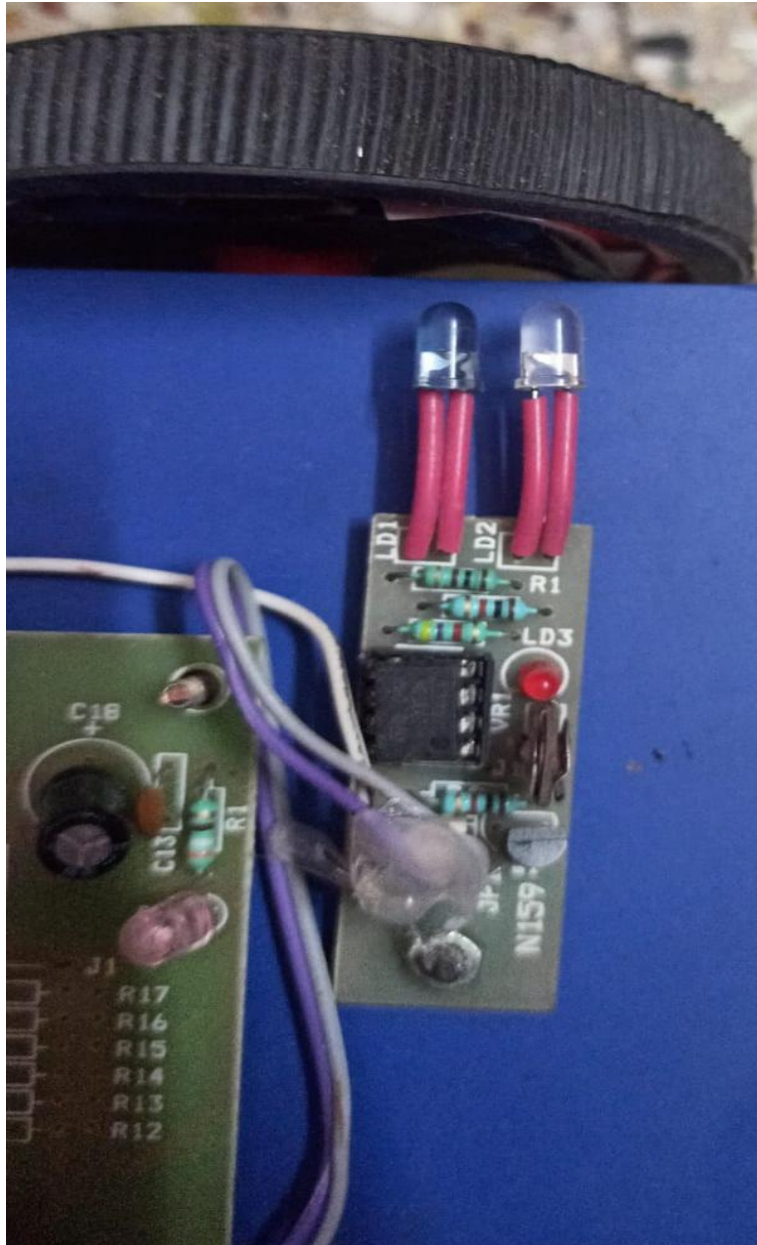
***Fig:4.5: Final Project Front View***



***Fig:4.6: Ball wheel***



***Fig:4.7: Robotic wheels***



*Fig:4.8: Dual infrared sensor*

## CHAPTER 5

### RESULT

#### 5.1 RESULT

As a consequence of this automated braking system, each portion of the system is functioning properly, and the whole system has been completed. When an obstruction is recognised, the vehicle's braking system applies the brakes according to the predetermined safety distance. An ultrasound sensor in this prototype has an accuracy of around 2cm to 1 metre and operates well within the specified range.

#### 5.2 FINAL OVERVIEW OF PROJECT

There was a DC gear motor and a servomotor that regulate the brakes on our project in our project, which we tested to make sure it worked. This technique is environmentally friendly, and the goal of this project is to minimise the number of accidents that occur when driving in dangerous situations. We've put several barriers in the way of the system to see how it works. When the barrier is put at different distances from the vehicle, the system responds by lowering the vehicle's speed. It also automatically shut off in prohibited places. This device provided very precise measurements within the range of values that could be understood.

## CHAPTER 6

### SUMMARY AND CONCLUSION

#### 6.1 SUMMARY

Vehicles slide backwards when halted in sloppy sections of a hill station. Accidents and property damage may result from rolling back vehicles slamming into the car in front of them.

A car exiting a parking lot at a mall may experience a 45-degree incline on its path. Because of the car in front of you, a restriction is placed on the clutch and brakes. In spite of this, the car continues to go ahead while also rolling backward.

When driving on a typical surface, releasing the clutch and letting off of the gas pedal is all that's needed to get the car moving ahead with little to no acceleration. If you're going downhill, zero or little acceleration isn't enough, thus the car goes backward.

#### 6.2 CONCLUSION

It has been a great experience for us to put our minimal expertise to use in this project and learn from it. While working on this project, we learned a lot about a variety of skills, including project planning, buying, assembling, and machining. It is our opinion that project work is the best way to bridge the gap between institutions of higher learning and the workforce.

We're pleased of ourselves for getting the job done in the allotted time. There are no problems with the sensor-operated pneumatic brake. Understanding the difficulty of maintaining tolerances and quality is something we can appreciate. We've done all we've been able to, making full use of the resources at our disposal.

To sum up our project, we'd want to add a few sentences on how we felt about it. As a result, we've devised a "REVERSE BRAKING SYSTEM" to aid in the discovery of low-cost automation methods. As a result of using pneumatic systems, operations run more smoothly. They may be improved and tailored to meet specific needs by using additional approaches.

### 6.3 FUTURE SCOPE

The term "automated braking system" refers to a control system based on the vehicle braking system. Using an ultrasonic sensor included into the autonomous braking system in this prototype, which could be applied to any vehicle, the driver will be warned when there is a short gap between the car and an obstruction. This method will give a stronger assurance for the safety of automobiles and minimise losses if it is made safer. As a result, car safety systems will be developed and may be in greater demand in the future.

Large heavy vehicles, such as buses, trucks, cranes, tractors, and the like, may also benefit from its usage. According to the current state of the vehicle, we are guaranteed to be able to get information about the detecting sense zone. The public sector and end consumers will greatly benefit from it. Avoiding traffic accidents in major cities is another benefit. So, we think it's a better idea to implement autonomous vehicle brakes at a reasonable cost.

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