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# Design and Fabrication of Self Adjustment Ground clearance Mechanism

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**ABSTRACT:** This system can providing better handling by using self adjustment Ground clearance mechanism to preventing the under body damage of the cars as well as bike to increasing better stability and handling. This project focuses on the integration of pneumatic cylinders to develop an automated system capable of adjusting a vehicle's ground clearance in real-time. Pneumatic technology offers several advantages, including rapid response times, reliability, and precise control. By employing sensors and control algorithms, the system can dynamically alter the vehicle's height based on driving conditions, load, and terrain. This adaptability not only improves the vehicle's performance and fuel efficiency but also enhances passenger comfort and safety, The all the components will be carried out. After making the assembly, the testing of set up will be carried out and then the result & conclusion will be drawn.

## I. INTRODUCTION

In the ever-evolving landscape of automotive technology, the demand for vehicles that can adapt to varying road conditions and driving environments has surged. One of the critical aspects influencing a vehicle's performance and versatility is its ground clearance. Traditional fixed ground clearance systems often result in compromises between on-road stability and off-road capability. To address this challenge, the project titled "Design and Development of an Automatic Ground Clearance System using Pneumatic Cylinders" aims to create a dynamic solution that enhances both the safety and functionality of modern vehicles..

## II. LITERATURE REVIEW

[1] "Development of Advanced Pneumatic Lifting and Ground Clearance Technique in Car" by Jagadeesh H, Navinsh B C

Author concluded that the pneumatics jacks can act in the place of hydraulic jacks efficiently. As our jack is in built the fatigue is less. Such that distraction driving is a major contributor to accident death, thus by implementing this System we can reduced the close impact potential accident. It would save time of installing a manual jack and washing of the lower body of the car as it would raise the car by about 2 feet. To minimize human effort.

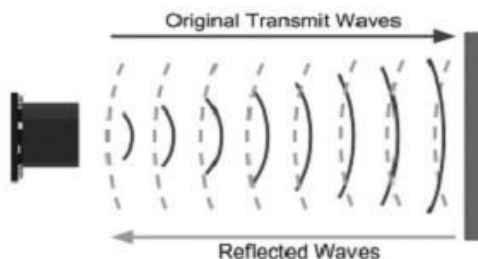
## III. OBJECTIVE

1. To Create a comprehensive design for the automatic ground clearance system, including the layout of pneumatic cylinders, sensors, and control units.
2. Implement a control algorithm that can process input from sensors and adjust the pneumatic cylinders to modify the vehicle's ground clearance in real-time.
- 3 Choose appropriate pneumatic cylinders, sensors, and control units, and integrate them into the vehicle's existing structure.
4. Ensure that the system is safe to use under all operating conditions and that it reliably adjusts the ground clearance without failure.

5. Develop a working prototype of the system and conduct testing to validate its performance.

#### IV.COMPONENTS

##### Ultrasonic sensor:



The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. It sends an ultrasonic pulse out at 40 kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

Connections:

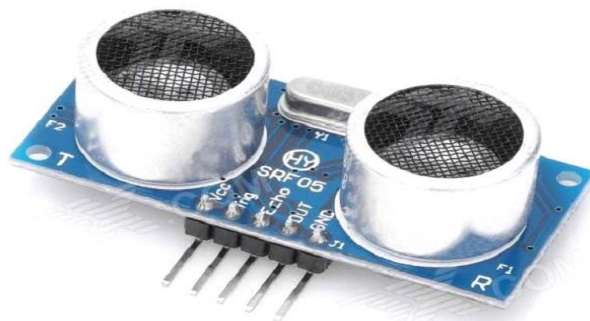
Vcc -> 5 V

Trig -> pin 13 (digital pin)

Echo -> pin 12 (digital pin)

Out ->

GND -> GND



##### Pneumatic cylinder:



Pneumatic cylinder is mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction. For

example, in the mechanical puppets of the Disney Tiki Room, pneumatics is used to prevent fluid from dripping onto people below the puppets. Pneumatic systems are often found in settings where even rare and brief system failure is unacceptable. In such situations, locks can sometimes serve as a safety mechanism in case of loss of air supply (or its pressure falling) and, thus remedy or abate any damage arising in such a situation.

**Specification**

Material	Aluminium
Shape	Cylindrical
Usage/Application	Automation
Type	Double acting
Colour	Silver
Dimension/Size	10-25 mm Bore Diameter

**Motor**



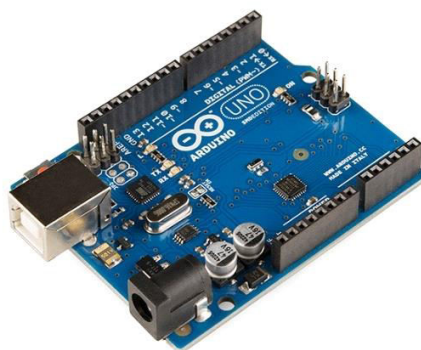
A motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of rotation of a shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates in the reverse direction, converting mechanical energy into electrical energy.

In addition to AC versus DC types, motors may be brushed or brushless, may be of various phase (see single-phase, two-phase, or three-phase), and may be either air-cooled or liquid-cooled. The largest electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. A coil of wire with a current running through it generates an electromagnetic field aligned with the centre of the coil. A simple DC motor has a stationary set of magnets in the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. The ends of the wire winding are connected to a commutator. These rotating magnetic fields interact with the magnetic fields of the magnets (permanent or electromagnets) in the stationary part of the motor (stator) to create a torque on the armature which causes it to rotate.

**Specification**

- High torque and low noise.
- Ball bearing, with cooling fan.

## Arduino Uno



The Arduino Uno is a popular microcontroller board used in electronics projects and prototyping. It is based on the ATmega328P microcontroller and is known for its ease of use, versatility, and extensive community support. Here are some key features and specifications of the Arduino Uno:

### Key Features:

- Microcontroller: ATmega328P
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- SRAM: 2 KB (ATmega328P)
- EEPROM: 1 KB (ATmega328P)
- Clock Speed: 16 MHz
- LED\_BUILTIN: Pin 13

### Connectivity:

- USB Connection: Used for power and programming the board.
- Power Jack: For external power supply.
- ICSP Header: For programming the microcontroller.
- Reset Button: To reset the microcontroller.

### Programming:

- Software: Arduino IDE (Integrated Development Environment), available for Windows, macOS, and Linux.

Languages: Arduino programming language (based on Wiring) and C/C++

## V.METHODOLOGY

- Literature Survey
- Gather and Review Research Papers
- Learn about Automatic Ground Clearance Adjustment
- Decide Required Components
- Create 3D Model and Drafting using CATIA
- Analysis



- Manufacture Components
- Conduct Experimental Observations
- Assemble Components
- Conclude Results
- Perform Calculations

## **VI.CONCLUSION**

- It has also been fabricated and allows the user the benefit of the automatic height adjustment. It is safe to use and has detector for obstacle which signals to adjust the height.
- The Self Adjustment Ground Clearance System has been designed with reduced manual effort.
- This System has been designed CATIA software with proper calculations and consideration.
- We tested the system and we achieved a height of 50mm while the the system lift. • Hence, the Self Adjustment Ground Clearance System has been designed, fabricated and tested with reduced physical effort at low cost having longer range for daily us

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