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Design and Fabrication of Intelligent Braking System

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Abstract -The intelligent braking system is an advanced technology that has been developed to improve the safety and performance of modern vehicles. This system uses sensors and microcontrollers to detect and respond to changes in the driving environment, allowing for faster and more accurate braking. The fabrication of an intelligent braking system involves the assembly and integration of these components, along with the necessary wiring and control systems. The system must be carefully calibrated and tested toensure that it operates reliably and safely under a variety of driving conditions. Overall, the intelligent braking system represents a significant advancement in automotive technology, providing increased safety and performance for drivers and passengers alike. As the technology continues to evolve, we can expect to see even more sophisticated braking systems that further enhance the driving experience.

Keywords-Intelligent Braking System, Emergency Braking System, Automatic Braking System, Smart Braking System, Advance Braking System.

INTRODUCTION

It's true that driving is a common and necessary activity for many people, and unfortunately, accidents are acommon occurrence on the road. Your idea for a system that can help prevent accidents by automatically stopping the vehicle when an obstacle is detected is a good one. It's important to note that while your system has the potential to improve safety on the road, it should not replace the need for drivers to be attentive and responsible while driving. Drivers should always be aware of their surroundings and prepared to react to unexpected obstacles or situations. In addition, it's important to consider the practicalities of implementing such a system in a vehicle. There may be technical and regulatory hurdles to overcome, and the cost of such a system may be a barrier for many drivers. Overall, your idea for a system that can automatically stop a vehicle when an obstacle is detected is a promising one, and could potentially contribute to improving road safety. However, it's important to approach the development and implementation of such a system with caution and careful consideration. An intelligent braking system is a type of automotive safety technology that uses advanced sensors and control algorithms to automatically adjust the braking force applied to a vehicle's wheels in response to changing road and driving conditions. The system is designed to improve

overall safety by reducing the risk of accidents caused by factors such as sudden stops, slippery roads, or driver error.The design and fabrication of an intelligent braking system typically involve the integration of various components, including sensors, processors, actuators, and control software. These components work together to monitor the vehicle's speed, acceleration, and other factors, and then adjust the braking force applied to each wheel to ensure maximum stability and control. In order to fabricate an intelligent braking system, engineers and technicians need to have a deep understanding of automotive engineering, control systems, and software development. They must also be able to work with a variety of specialized tools and technologies, such as sensors, processors, and actuators. Overall the design and fabrication of an intelligent braking system is a complex and challenging task, but it can have a significant impact on the safety and performance of modern vehicles.

LITERATURE REVIEW

1. Yes, it's fascinating to see how modern technology can improve safety features in vehicles. VHDL (VHSIC Hardware Description Language) is a hardware description language used to design digital circuits and systems, and it can be particularly useful in designing safety features for vehicles. Auto-braking systems are becoming more common in modern vehicles and can be a valuable tool for preventing accidents or reducing their severity. The use of sensors is also critical in making these systems effective, as they can detect obstacles or potential collisions and activate the auto-braking system accordingly. Overall, this type of research and development is crucial in making driving safer and more efficient. The system uses a sensor to detect the distance between the front vehicle and the driver's vehicle to maintain a constant distance, and it can force the brake system to operate if the driver does not decrease the speed of the car. According to the paper, the auto-braking system also displays the distance between the two vehicles and the speed of the driver's vehicle, which can be helpful in providing the driver with relevant information about the current driving conditions. It is good to know that the performance of the system was reported to be good, although further testing and evaluation may be necessary to ensure its reliability and effectiveness in real-world driving scenarios.
2. [e-ISSN: 2582-5208 International Research Journal of Modernization in Engineering Technology and Science]

   In the research paper "Intelligent Braking System" by Gajanan Koli et al., an IR sensor is used to sense obstacles and apply the brake to avoid collisions. However, it is important to note that IR sensors can be affected by external factors such as smoke, fog, and sunlight. This can lead to false readings and potentially cause the system to malfunction. Therefore, it is necessary to consider these factors when designing and implementing such systems, and to use additional sensors or technologies to compensate for any limitations or weaknesses of the IR sensor.

3. [International Journal on Recent and Innovation Trends in Computing and Communication] Honda's ABS and Volvo's laser-assisted braking systems. It's important to note that both of these technologies have their limitations and drawbacks. ABS can be very helpful in preventing skidding and wheel locking, especially in wet or muddy conditions. However, as you mentioned, it relies on the rider applying the brakes at the right time and maintaining proper distance calculations. Additionally, ABS has its own braking distance, which can be longer than traditional braking systems. One of the major drawbacks of ABS is that it can be expensive to implement, which is why many commuter bikes in India don't have it. However, it's worth noting that as technology improves and becomes more widely available, ABS may become more affordable and accessible. Volvo's laser-assisted braking system is a promising technology that can detect collisions and apply brakes automatically. However, it's important to note that this system may not work effectively in certain weather conditions, such as rainfall or snowfall, as the laser can be affected by atmospheric conditions. Overall, while both ABS and laser-assisted braking systems have their limitations, they represent important steps forward in improving road safety and preventing accidents. It's important for manufacturers to continue investing in and improving these technologies to make them more effective and accessible to all drivers.

PROBLEM STATEMENT

Intelligent braking systems are a technological advancement that can help in preventing accidents caused by driver delay or error. These systems ultrasonic waves to detect obstacles in front of the vehicle and then automatically apply the brakes to prevent a collision. The advantages of Intelligent braking systems include the ability to avoid accidents, reduce the need for human effort in emergency situations, enhance safety, and prevent human error. By detecting obstacles in front of the vehicle and applying the brakes quickly, these systems can help to prevent accidents and save lives. In addition, these systems can also help to reduce the overall number of accidents on the roads, which can have a significant impact on the safety of drivers and passengers. As such, ultrasonic braking systems are an important technological advancement that can help to make driving safer and more efficient.

PARTS OF SYSTEM

Frame, Wheel shaft, Microcontroller, Relay, Double Acting Cylinder, ½ Pneumatic solenoid valve, DCMotor, Battery.

DESIGN AND CALCULATION

DESIGN OF MOTOR

Assume the mass of vehicle (mass=30kg)

[NOTE= Including all wheel, frame and other parts of vehicle.]

1. Now Assuming the Velocity of Vehicle V=30 kmph.

   V= 8.33 mps

   [NOTE= Velocity is taken from reference paper (12)]

2. Total force(F) on vehicleF= m*g

   Rr= Rolling Resistance

   [It is one of the constant value is taken 0.03. Taken from reference paper (10)]g= gravitational Force

   m= mass of vehicle

   F= 30*9.81

   F=8.8 N

3. Calculating the power

   Power = Force * velocityP= 8.8*8.3

   P= 73.04

   P= 80 Watt

4. Calculate the Torque

   Let we take the Diameter of wheel is 15inch

   D= 0.381m

   [NOTE=Generally the four-wheel vehicle Diameter is in between 13 to 18 inch in India, so for calculation we take the average value of wheel Diameter as 15inch(381mm)]

   Torque = Force * Radius of wheel

   = 8.8* 0.1905

   Torque = 1.67Nm.

5. Calculating the Rpm

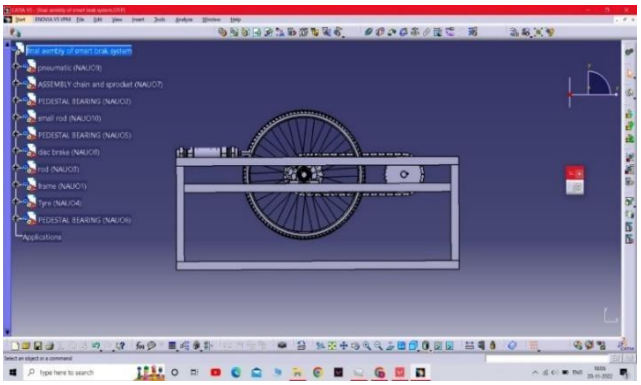
   P= (2*3.14*N*T) / 60

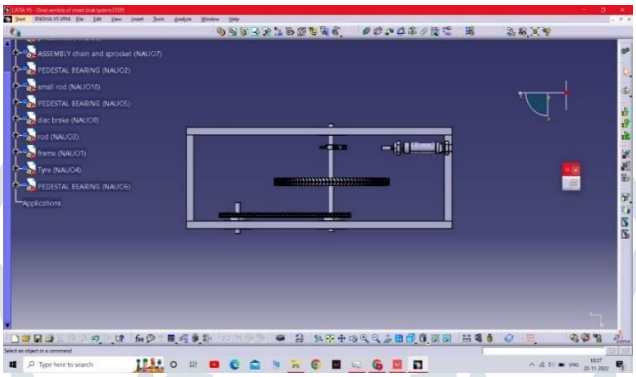
   N= (P*60)/(2*3.14*1.67)

   N= 457 rpm

   N= 500 rpm

CATIA MODEL



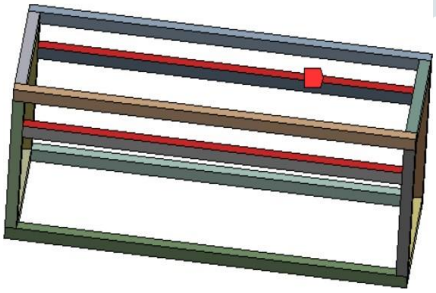


DIMENSIONS OF FRAME:

- Length of Frame = 600mm
- Height of frame = 400mm
- Width of frame = 250mm

ANSYS ANALYSIS

Geometry



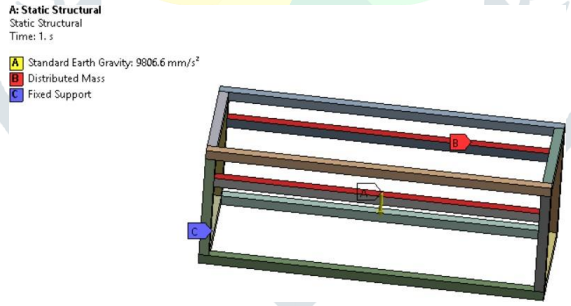
Statistics	
Nodes	43008
Elements	6822

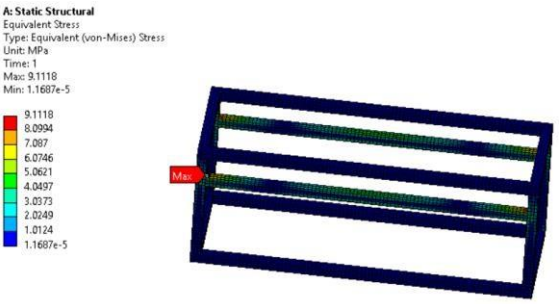
Mesh

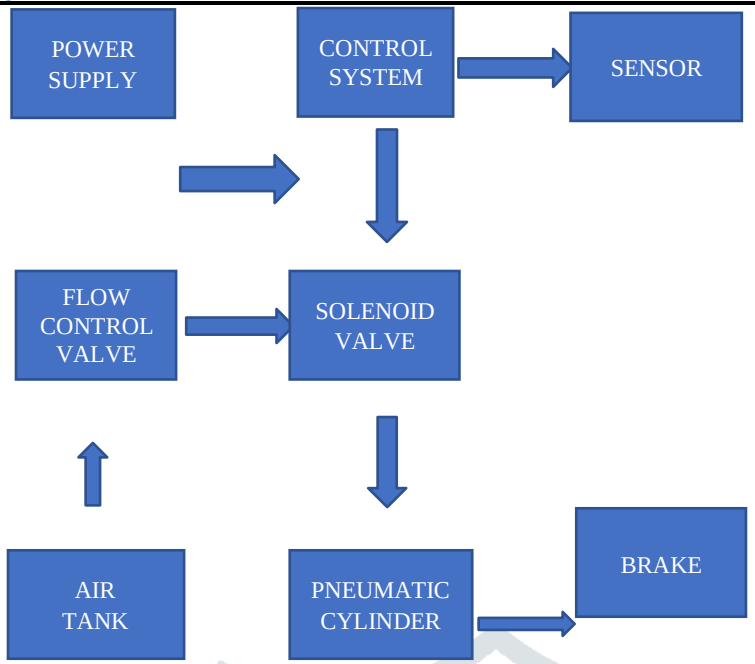
Type	Element Size
Element Size	5.0 mm

Properties of Outline Row 3: Structural Steel

	A	B	C
1	Property	Value	Unit
2	Material Field Variables	Table	
3	Density	7850	kg m^-3
4	Isotropic Secant Coefficient of Thermal Expansion		
6	Isotropic Elasticity		
12	Strain-Life Parameters		
20	S-N Curve	Tabular	
24	Tensile Yield Strength	2.5E+08	Pa
25	Compressive Yield Strength	2.5E+08	Pa
26	Tensile Ultimate Strength	4.6E+08	Pa
27	Compressive Ultimate Strength	0	Pa



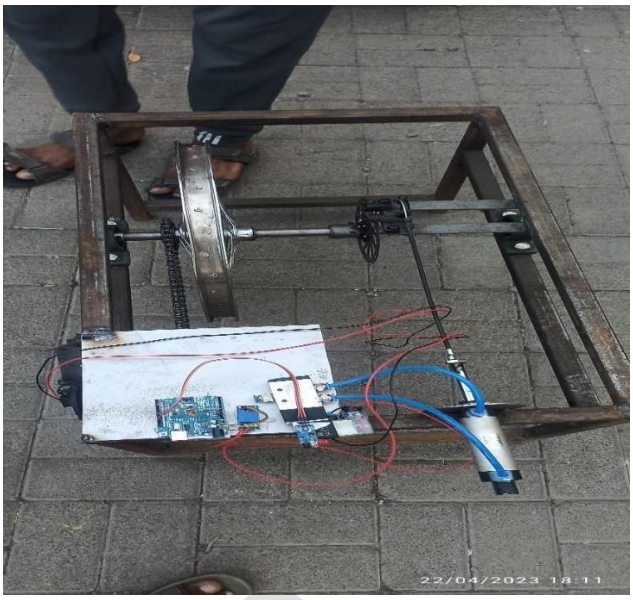




WORK FLOW DIAGRAM

RESULT

It's great to hear that the automatic braking system is functioning properly and achieving its intended purpose of improving safety on the road. The success of the system is likely due to the coordinated and effective functioning of each part of the system, which work together to detect obstacles and apply the brakes as needed. The determination of the safety distance is a crucial step in the process, as it helps to ensure that the vehicle has enough time to brake before colliding with an obstacle. Once the safety distance has been established, the system can use sensors or other technology to detect obstacles within that range and trigger the braking mechanism. Overall the successful functioning of the automatic braking system demonstrates the importance of well-designed and well-coordinated engineering systems in ensuring safety and preventing accidents on the road.



CONCLUSION

The intelligent braking system is a great example of how technology can be used to enhance safety on the roads. By incorporating sensors that can detect obstacles in the path of the vehicle, the system is able to anticipate potential collisions and apply the brakes automatically to avoid them. This can be especially useful in situations where the driver may be distracted or unable to react quickly enough to avoid an accident.In addition to improving safety, the intelligent braking system can also help to improve vehicle performance. By providing efficient speed control on inclined roads, the system can help to prevent the vehicle from rolling backwards or losing control, which can be especially important for larger vehicles or those carrying heavy loads. Overall the intelligent braking system is a promising technology that has the potential to significantly Ztechnology continues to advance, it will be interesting to see how this and other advanced safety systems are incorporated into future vehicles.

FUTURE SCOPE

While it is true that advancements in technology are bringing us closer to the reality of assisted driving and proactive safety warning systems, it is important to note that complete automation of vehicles may still be a long way off. The development and implementation of reliable and safe autonomous vehicles require rigorous testing and validation, as well as addressing ethical and legal considerations. Additionally, the adoption of autonomous vehicles may also depend on public perception and acceptance. In terms of future related works, it is important to continue research and development in new sensory systems and sensory fusion, as well as improving the algorithm for autonomous formation of cooperative driving. Additionally, addressing cybersecurity concerns and developing secure and trustworthy autonomous systems is crucial to ensure the safety of passengers and other road users. Overall while the deployment of fully autonomous vehicles may take some time, the continued research and development in this area will undoubtedly lead to safer and more efficient transportation systems.

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