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Automated Pneumatic Braking and Bumper System

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Abstract: ***Automobiles have been used to move human beings or things and the automobile technology has been developed within the last few years. The traffic accidents are increasing as automobile production has been increasing. The number of casualties during the vehicle accidents is very large as compared to the other causes of death. It is important to prevent accidents and to protect the driver and pedestrian when accidents occur. Though there are different causes for these accidents but proper technology of braking system and technology to reduce the damage during accident (such as pneumatic bumper system) can be effective on the accident rates. Therefore, pre-crashing system is demanded. Automotive safety has gained an increasing amount of interest from the general public, governments, and the car industry. The pre-crash system is to prevent accidents on roads with poor visibility by using sensor network to find invisible vehicles, which are to be detected by autonomous on-vehicle sensors. The pre-crashing system is processing the sensor data and controlling the vehicle to prevent accidents and accidents caused by careless driving. The pneumatic system is simple and easy in operation and hence can be used in automation industry.***
Keywords: Braking, Pneumatic Bumper, Cylinder, Control Unit, Sensor

I. INTRODUCTION

Today India is the most important under developed country in the world. India is the largest country in the use of various types of vehicles. As the available resources to run these vehicles like quality of roads, and unavailability of new technologies in vehicles are causes for accidents. The number of peoples which are dead during the vehicle accidents is also very large as compared to the other causes of death.

Though there are various causes of the accidents but proper technology of braking system and technology to reduce the damage during accident are main ly effects on the accident rates. So today implementation of proper braking system to prevent the accidents and pneumatic bumper system to reduce the damage is must for vehicles. To get this system implementation goal, we design this Automated Pneumatic Braking and Bumper System.

It is the project which has been fully equipped and designed for auto vehicles. In regular vehicles there is various mechanism operated for the braking system like use of hydraulic, pneumatic, or mechanical system. But all these braking mechanisms receive the input signal directly from the driver by application of force on brake pedal. Thus, braking of vehicles is totally manual operated. So, if the driver fails to see the obstacle in front of his driving vehicle or fails to apply proper braking force on the brake pedal, he may lose the control of his vehicle, leading to accident. Also the driver may not able to pay complete attention when driving at night. So there are many chances of accidents. Urgent application of brakes can result in veering of the vehicles due to skidding of tyre. Moreover, due to sudden application of brakes there are chances of other vehicles dashing from back. Hence, there is no provision to minimize the

damage of vehicles. Thus, the current designed system only fairly reduces the damage of vehicle and/or passengers. It is the project which has been fully equipped and designed for auto vehicles. The technology of pneumatics plays a major role in the field of automation and modern machine shops and space robots. The aim is to design and develop a control system based on intelligent electronically controlled automotive bumper activation system is called “automatic pneumatic bumper and break actuation before collision”. The project consists of IR transmitter and Receiver circuit, Control Unit, Pneumatic bumper system. The IR sensor senses the obstacle. There is any obstacle closer to the vehicle (within 1feet), the control signal is given to the bumper and break activation system. This bumper activation system is activated when the vehicle speed above 40-50 km per hour. The speed is sensed by the proximity sensor and this signal is transfer to the control unit and pneumatic bumper activation system.

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II. PROBLEM STATEMENT

As in new era we need smart systems to make easy our life. Also, vehicle accident scenario we all need smart safety system. As in vehicles new advancement is going to developed & also according to safety we approach this project. As safety point of view, we developed the system which protects driver and passengers but also protects vehicle from damage.

A. Objectives

1) To increase the sureness of braking Application.
2) To increase the response time of braking system.
3) To improve the pre-crash safety.
4) To avoid the percentage of passenger injury by using external vehicle safety.
5) To reduce the requirement of internal safety devices like air bags.

III. COMPONENTS USED

A. Pneumatic Single Acting Cylinder

The cylinder is a Single acting cylinder one, which means that the air pressure operates forward and spring returns backward. The air from the compressor is passed through the regulator which controls the pressure to required amount by adjusting its knob. A pressure gauge is attached to the regulator for showing the line pressure.



Fig. 1 Pneumatic Cylinder

B. Solenoid Valve

A solenoid valve is a combination of two basic functional units A solenoid (electromagnet) with its core. A valve body containing one or more orifices Flow through an orifice is shut off or allowed by the movement of the core when the solenoid is energized or de-energized. valves have a solenoid mounted directly on the valve body.



Fig. 2 Solenoid Valve

C. Hose

A hose is a flexible hollow tube designed for carrying the fluid & air from one location to another. Hoses are also sometimes called pipes or more generally tubing. The shape of hose is usually cylindrical (having a circular cross section).



Fig. 3 Hose

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D. Sensor

The sonic transmitter and sonic receiver circuit is used to sense the obstacle the ultrasonic wave detects the obstacle, it will produce wave. Ultrasonic receiver is used for receiving the ultrasonic wave reflected from the road surface to generate the reception signal.

IV. CONSTRUCTION AND WORKING

The compressed air from the compressor at the pressure of 5 to 7 bar is passed thought in pipe connected to the solenoid valve with one input. the solenoid valve is attached with control timing unit , the solenoid valve has two output & one input , the air entering the input goes through the two output when the timing control unit is actuated due to the high air pressure , at the bottom of piston the air pressure below the piston is more than the pressure above the piston , so these move the piston rod upwards ,which move up the effort are which is pivoted by control unit , these force acting on the punch /rivet which also move the downwards . The ultrasonic transmitter circuit is to transmit the sonic rays, if any obstacle is there in path the sonic rays reflected, by these reflected sonic rays are received receiver . These circuit is called sonic rays' receiver the ultrasonic rays receiver circuit receive the reflected sonic rays & giving the control signal to the control circuit, the control circuit is is used to activate the solenoid valve. The operating principle of solenoid valve is already known, if solenoid valve is activated the compressed air passes to the single acting pneumatic cylinder compressed air activate. the pneumatic cylinder move the piston rod. if the piston moves the forward then the breaking arrangement is activated. the working arrangement is used to brake the wheel gradually or suddenly due to the piston movement, the braking speed is varied by adjusting the valve, this valve is called as "Flow control valve". In our project we must apply this braking arrangement is one wheel as a module, the compressed air down from the compressor. In our project polyurethane tube to the solenoid valve.

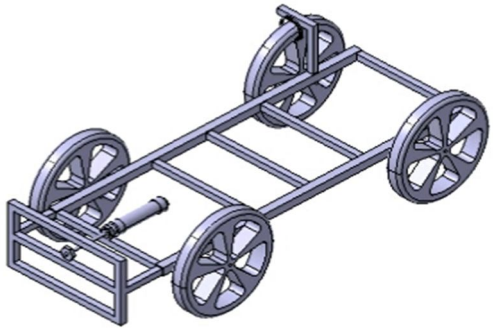


Fig. 4 Cad Model

A. Advantages and Limitations

1) Advantages

a) It able to Increase the sureness in braking system.
b) Braking system able to give fast response.
c) System able to increase the pre-crash safety.
d) System able to provide more safety to the passengers.
e) System plays an important role to save human.
f) Life in road accidents.

2) Limitations

a) System has few limitations in densely traffic road.
b) Due to the linkages there will be frictional losses.
c) Maintenance will be more due to the number of moving parts.
d) Stroke length is fixed.

3) Applications

a) This system may be applicable in all types of light vehicles like cars, Rickshaws, Tempos.
b) This system also successfully installed in the heavy vehicles like buses, trucks

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V. CONCLUSION

Automated Pneumatic Braking and Bumper System system is very much beneficial to vehicle to safety point of view. As we developed demo of smart brake system which is able to brake the vehicle up to 60 to 80 cm of frontal range. We found the performance of our demo is good. If we use this in actual vehicle we have to integrate this system with ECU means engine control units. This will enable us precise control over speed of vehicle and bumper movement. We use ultrasonic sensor in this project but we have to use high range sensor to senses the distance up to 5 to 6 meters to avoid collision at high speeds.

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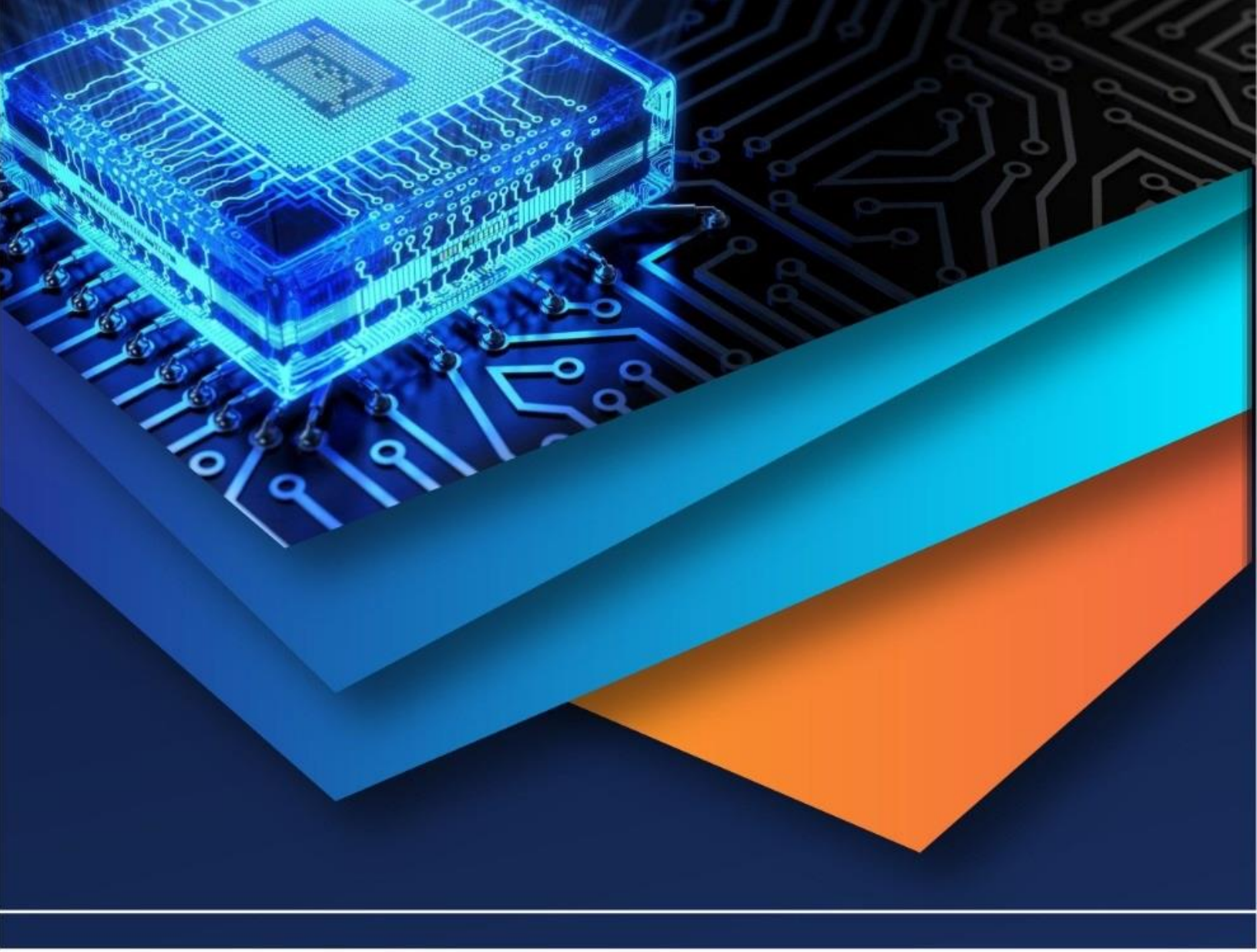
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