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COMPREHENSIVE DESIGN AND FABRICATION OF AN AUTOMATIC DRIVER LOAD SENSING BRAKING SYSTEM: ENHANCING SAFETY AND EFFICIENCY IN MODERN VEHICLES

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ABSTRACT
Automatic load sensing braking System is nothing but one of the braking systems in the automobile industries which help at the time of drivers not in seat as well as this is additional braking system to be added in the hand break system. This braking system is a pneumatically operated one. Here the additional pneumatic cylinder and the load sensor are provided in the automobile itself. In this project, the load sensors with microcontroller units are used to activate/deactivate the solenoid valve. When the load sensor senses the load and this signal given to the microcontroller unit it will activate the relay unit. This signal is used to activate the solenoid valve, so that the compressed goes to the pneumatic cylinder. Then the compressed air passes through the tube, and then pushes the pneumatic cylinder, so that the braking is applied at that time. The speed of the pneumatic cylinder is varied by using flow control valve. This is the way of controlling braking speed of the vehicle.

Keywords:
brake, microcontroller, pneumatic

I. Introduction
The pneumatic braking circuit can stop the vehicle within few seconds being the vehicle moving at a suitable speed. The intelligent braking system is fully automated using the pneumatics. This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased. Degrees of automation are of two types, viz. • Full automation. • Semi automation. In semi automation a combination of manual effort and mechanical power is required whereas in full automation human participation is very negligible. Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc. Of these sources, pneumatics forms an attractive medium for low cost automation. The main advantages of all pneumatic systems are economy and simplicity.

1.1 Types of braking
• Mechanical Brake
• Hydraulic Brakes
• Air Brake • Electric Brake
• Vacuum Brakes / Servo Brakes
• Regenerative Braking

1.2 Problem statement

With the Existing brakes and Hand Brakes many of the Drivers Experience the Brake failure. Which results in the accident Which can take lifes In order to prevent 2 that we have developed the Automated pneumatic brake system which can reduce the accident and save lives.

III. Literature

The creation of a driver intention detection algorithm[5][11] for automated emergency braking systems is described in this work. In the event that the driver already has a braking intention, this could be modified or aborted. When driver intention recognition suggests safe behaviour planning, the number of warnings can be decreased. Pedestrian protection[6][12][14] systems, in particular, will be beneficial in metropolitan areas where pedestrians may frequently enter the vehicle's path. Drivers' intention is measured using a standard procedure. Indicators such as an algorithm, for determining whether or not a driver intends to brake. Pedestrian protection with Active Safety Systems. Haptic shared control[5] is a promising method since it allows the human driver to communicate with automation in real time via a haptic interface. The multimodal interface shared control has gotten a lot of attention because it's supposed to make interaction more natural and less distracting. Performance gains from haptic shared controls include faster response and reduced control activity. Path-based techniques[9][18] and reference-free approaches, both centered on the driving task and sharing a common reference trajectory, are two types of shared control systems. Model predictive control, rapidly exploring random trees[6][13], and the geometric technique are all path-based planning methods. When the automobile is in 4 reverse, an ultrasonic sensor[7][15] on the back bumper is engaged. It detects an obstruction (vehicle) behind it and applies changing pressure to the automobile brakes until it comes to a complete stop. So a Network architecture (based on learning algorithm) and Sigmoid Activation Function Generator can be used in this case. The findings highlight the issues at hand as well as the possibilities for implementing a "intelligent" control[8][16] technique. The design of current automobiles has been profoundly influenced by the new generation of sensor-rich, distributed autonomous control technology. Control systems that considerably improve vehicle performance have been developed using the intelligence provided by resilient embedded microelectronics[22] throughout the vehicle, as well as communications network topologies. The development of software simulation approaches that leverage a variety of system dynamic models[23] with the goal of generating superior vehicle control strategies can lead to a better knowledge of vehicle performance. The current Bang-Bang control[3][9][17] implementation is extremely harsh in terms of the physical shock the driver feels when the system is engaged by brake pedal pulsations. The sections that follow assess various options and give an estimate of the level of system performance that can be attained. The benefits of such intelligent control include the ability to take full advantage of advancements in Smart Tyre technology[13] as well as the increasing integrity of microtechnology. The system will be built to keep the driver and passengers safe inside the car. They'll employ an ultrasonic sensor to detect the impediment and an infrared sensor to activate the automated braking system. The system will be designed to keep the driver and passengers safe inside the car. The system employs an ultrasonic sensor to identify an impediment or moving vehicle ahead and notifies the driver of the potential for a collision. When following another vehicle, the speed control system will automatically provide the driver with 5 information regarding the distance between the automobile and the obstacle via an LED display. The controller takes full control of the car's speed from the driver or user, and the microcontroller decides whether or not to engage the automatic braking system, causing our vehicle to stop automatically. In basic terms, it warns drivers to slow down and warns them about potential accidents, as well as saving the lives of the driver and passengers within the car or vehicle

IV MATERIALS AND METHODS

In this chapter, the components involved, their respective design and materials involved for the fabrication of Automatic Driver load sensing Breaking system are discussed.

A) Material selection

COMPONENTS	MATERIALS
Motor	AC
Pneumatic cylinder	Al
Control Board	Wood
Belt	Rubber
Pulley	MS
Bearing	MS
Load sensor	Semi conductor
Shaft	MS
Flow control valve	Al
Solenoid valve	Al

b) Components involved

The major components involved in the fabrication of the load sensing braking system are as follows.

- Frame
- Pneumatic cylinder
- Load sensor
- Microcontroller unit
- Solenoid valve
- Flow control valve
- Motor.

c) Design

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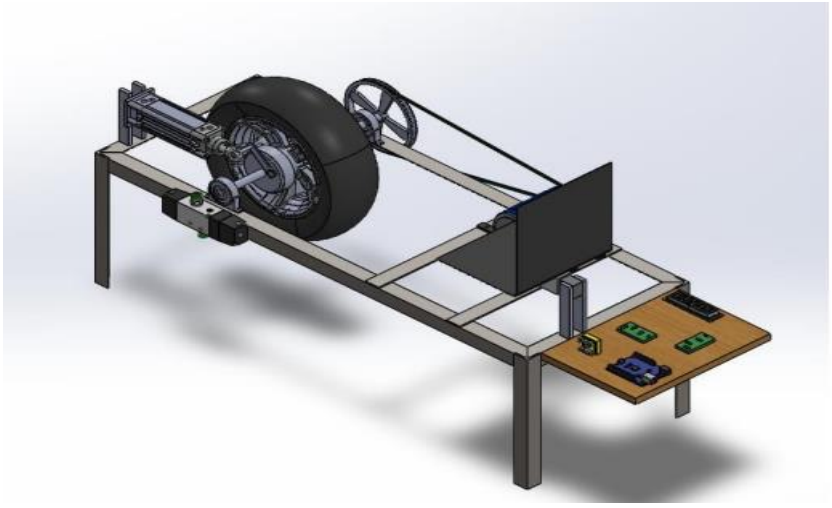

Fig .1 frame design

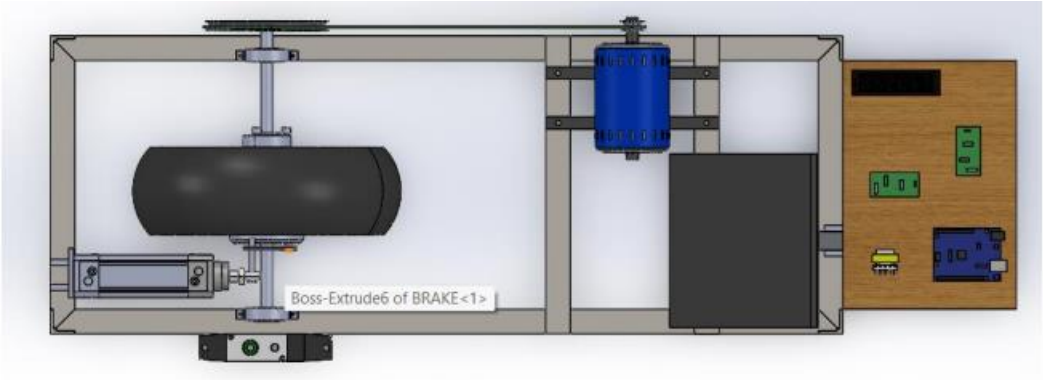

Fig .2 Top view

Fig.3 Fabricated model

V RESULTS AND WORKING

A ground truth for existing or not existing braking intention is needed to specify the false-positive detection rate of the algorithm. Unlike in other driving manoeuvres, a braking intention does not need to be transformed into action. Simple perception of the pedestrian and readiness to brake is adequate behaviour and Sufficient to cancel an needless warning. A rule-based approach to detect brake intention is developed based on the theoretical assumptions from the introduction and the empirical data from the experiment. If these circumstances are met, the indications will reflect the driver's intention to brake.

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Working Principle

The load sensor is fixed bottom of the driver seat. The air tank contains the compressed air already filled. When the load sensor senses the load and this signal given to the microcontroller unit it will activate the relay unit. This signal is used to activate the solenoid valve, so that the compressed goes to the pneumatic cylinder. If the solenoid valve is activated, the compressed air passes to the Single Acting Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the breaking arrangement activated. The breaking arrangement is used to break the wheel gradually or suddenly due to the piston movement. The breaking speed is varied by adjusting the valve is called "FLOW CONTROL VALVE". In our project, we have to apply this breaking arrangement in one wheel as a model. The compressed is air drawn from the compressor in our project. The compressed air is flow through the Polyurethane tube to the flow control valve. The flow control valve is connected to the solenoid valve as mentioned in the block diagram.

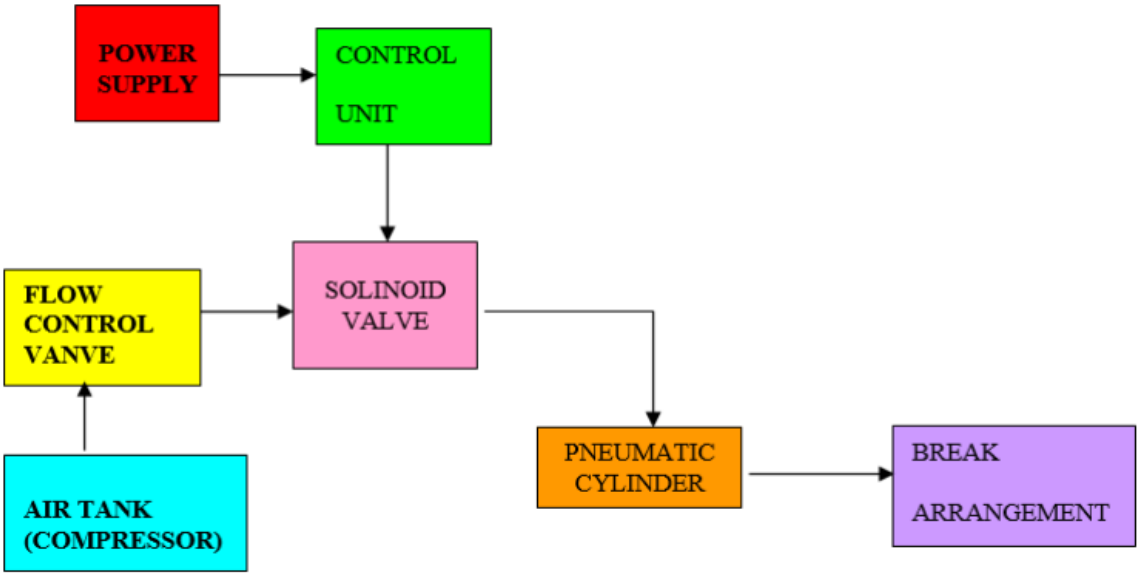

Fig 5.1 Block Diagram of ALSDS

Conclusion

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institution and the industries. We are proud that we have completed the work with the limited time successfully. The "FABRICATION OF LOAD SENSING BRAKING SYSTEM" is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities In conclusion remarks of our project work, let us add a few more lines about our impression project work.

References

1. www.trw.com/integrated_systems/active_passive_systems/automatic_emergency_braking (accessed on 18th March 2016).
2. S. Kumar and V. Kumar "Automatic emergency braking system" International Journal of Research in Science & Engineering Volume: 1 Issue: 3.

3. G.V. Sai Ram, B. Suresh, CH. Sai Hemant and K. Krishna Sai "Intelligent Mechatronic Braking System" International Journal of Emerging Technology and Advanced Engineering Volume 3, Issue 4, April 2013.
4. P.R. Niveditha and S.Gowri "Collision Warning System using Ultrasonic Sensors and Automatic Brake System" Proc. of Int. Conf. on Recent Trends in Information, Telecommunication and Computing, ITC.
5. www.autoblog.com/2012/06/15/euro-ncap-will-soon-require-auto-braking-forfive-star-safety-ra/ (accessed on 20th March 2016).
6.www.thatcham.org/car-safety//wp-content/uploads/2016/02/The-different-namesfor-AEB.pdf (accessed on 21st March 2016).
7. Wei Zhang "Vehicle Pedestrian Detection using Stereo Vision Technology" 3rd International Conference on Road Safety and Simulation, September 14-16, 2011, Indianapolis, USA.
8. www.euroncap.com/en/press-media/press-releases/study-confirms-higheffectiveness-of-low-speed-autonomous-emergency-braking-aeb (accessed on 22nd March 2016).
9. http://www.telegraph.co.uk/motoring/road-safety/9630767/Cheaper-insurancefor-cars-with-auto-braking.html (accessed on 16th March 201