ACADEMICIA
An International Multidisciplinary Research Journal
(Double Blind Refereed & Peer Reviewed Journal)

DOI: 10.5958/2249-7137.2021.02366.1

A BRIEF REVIEW ON THE INTELLIGENT BRAKING SYSTEM

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ABSTRACT

Using the built-in system architecture, the braking mechanism was developed and integrated to the vehicle to guarantee the safety of the driving phase. The majority of crashes occur as a result of the driver's failure to apply the brakes in a timely manner. However, throughout this project's development, the braking mechanism is specified such that the brake should be applied depending on the ultrasonic sensor and the vehicle's speed. Cars are now equipped with active protection systems to minimize the danger of accidents, which are common in metropolitan areas. The most popular types are Antilock Braking Systems (ABS), Traction Control, and Stability Control. Various kinds of sensors are employed in these gadgets to constantly monitor the vehicle's surroundings and react in an emergency scenario. An ultrasonic wave emitter on the vehicle's front side is used in the intelligent braking system. Furthermore, the receiver is mounted on the vehicle's front end and receives a reflecting ultrasonic pulse. The distance between the problems and the vehicle is determined by the reflected wave (detected pulse), while the car's speed is determined by the RPM counter. The microcontroller assists the identification pulse information in shifting the foot lever to apply the brake to the automobile, which is unexpected for safety reasons.

KEYWORDS: *ABS, brake, Hydraulic Brake, Intelligent, Microcontroller, Sensor,*

INTRODUCTION

Commercial vehicles' braking systems have traditionally been given top attention in terms of safety considerations, particularly active safety. These cars' improper braking may result in severe accidents. Longer stopping distances and better brake energy performance, particularly in the case of vehicle combinations[1]. The conventional braking medium (compressed air) is also

handled at a higher speed and with more precision thanks to new technological capabilities. In commercial vehicles, IBS is used to offer quick braking response and release for any single wheel. Electronic control is also utilized to provide a rapid amount.The purpose of a braking system is to slow and stop the vehicle's movement. Various components within the braking system must convert the vehicle's moving energy into heat in order to do this. Friction is used to accomplish this. Friction is the resistance to movement that two things exert against one another. A vehicle's control is affected by two types of friction: kinetic or moving friction and static or stationary friction. The degree of friction or resistance to movement is determined by the materials in contact, the smoothness of their rubbing surfaces, and the pressure that holds them together.

In a word, a car brake works by generating friction and turning kinetic energy into heat energy by applying a static surface to a moving surface of a vehicle. The following are the high-level mechanisms. Rough-texture brake pads or brake shoes are pushed against the spinning components of the vehicle, whether disc or drum, when the brakes on a moving car are applied. The vehicle's kinetic energy or momentum is subsequently transformed into heat energy by the rubbing surfaces' kinetic friction, and the automobile or truck slows down.Static friction holds a vehicle in place when it comes to a halt. Any movement is resisted by the friction between brake surfaces, as well as the friction between tires and roadways. Brakes are released to counteract the static friction that keeps the vehicle from moving. The car moves because the heat energy of the in-engine combustion is transformed into kinetic energy via the transmission and drive system. Figure 1 shows the sketch of the intelligent braking system.

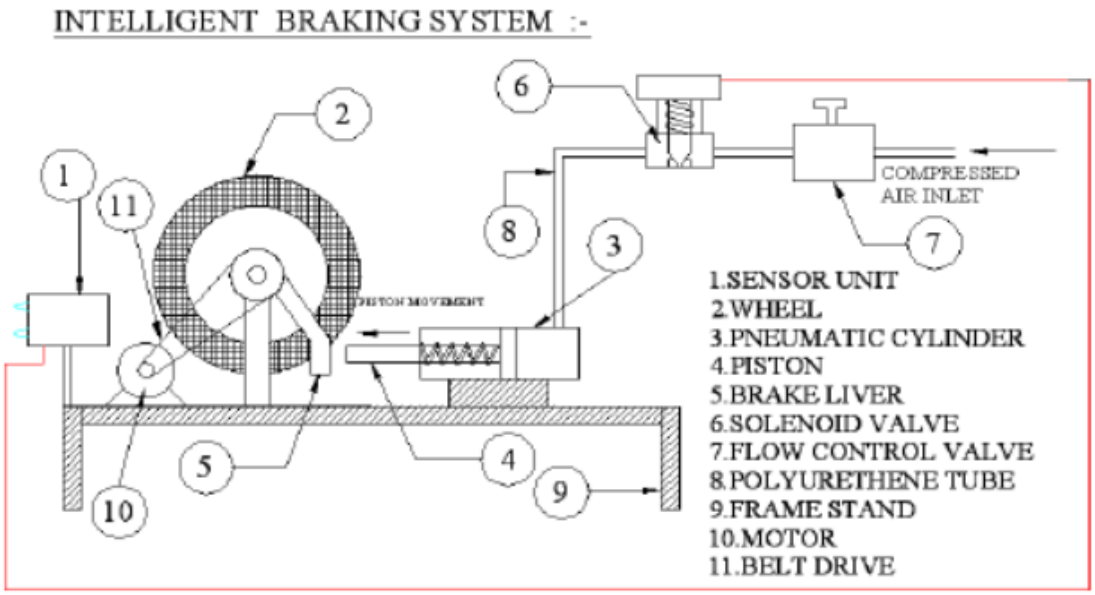

Figure 1: The Sketch of the Intelligent Braking System[2]**.**

By adopting better brake system control, the braking distance will be drastically reduced. Such a complex task put on the management of the braking mechanism cannot be sustained by the driving force's capability and must be carried out independently of it. It would be much simpler to complete the job if the ABS braking powers could be better controlled. The braking force

management method described here is based on intelligent regulation of braking force application between the propelled vehicle's front and rear axles, as well as between the towing/trailer combination and the tractor/semi-trailer combination [3].

Intelligent braking systems have a wide range of potential uses, particularly in emerging nations, where car and intelligent highway research smart is gaining traction. When coupled with additional subsystems such as automated traction control, intelligent throttle control, auto cruise control, and so on, the system would result in smart vehicle handling. The rider will be the leading force at the end of the day, safety will be prioritized, and the trip will be designed in terms of its slow duration, cost, productivity, and luxurious capacity [4].The impact of such design and manufacturing would be comparable with the needs of a society up to this point, which likewise strives to a quality drive to meet those needs. Technological advancements, particularly in the area of smart sensors and actuators[5]The creation of a digital signal processor boosts the microcontroller's power and usefulness. The value of the inter-vehicle distance from the infrared laser sensor and the speed of the following car from the speedometer are sent into the DSP for processing, resulting in the DSP functioning well to the actual situation[6].

1.1 Need for the Proposed Framework:

Accidents are caused by either a technical failure within the vehicle or a driving mistake. Drivers often lose control of their vehicles, and irresponsible driving may result in an accident. When it comes to drivers, they become frightened when they see the vehicle going into a collision, and they don't use the brakes. This is how the majority of injuries occur [7]. The gadget was created to prevent such accidents. Keeps track of all types of cars approaching from behind. It will keep track of the distance between the two vehicles. If two vehicles are dangerously close together, the system's microcontroller may activate the brakes to bring the vehicle to a halt [8].

1.2 Current System

In addition to Volvo's Laser-assisted braking, Honda's idea of ABS enables the rider to have a stress-free stopping experience on slick and wet terrain by providing dispersed braking and avoiding skidding and wheel locking. This system can anticipate a collision up to 50 mph and immediately activate the brakes. ABS can only activate assistance if the rider actively sets the time and controls the space measurements[9].

1.3 Characteristics of Brakes:

Several qualities are often used to characterize brakes, including:

The greatest decelerating effect that may be achieved is known as the peak force. The peak force is often higher than the traction limit of the tires, resulting in a wheel skid.

1.3.1Continuous power dissipation:

When brakes are used, they get hot and may fail if the temperature rises too high. Continuous power dissipation is the maximum amount of power (energy per unit time) that may be dissipated via the brake without failure. The temperature and speed of ambient cooling air, for example, have a significant impact on continuous power dissipation. Brake fade occurs when a brake becomes less efficient as it warms up. Some designs are prone to fading by nature, while

others are quite resistant. Furthermore, factors such as chilling have a significant impact on the fade.

1.3.2Smoothness:

Skids may be caused by a brake that is grabby, pulses, chatters, or otherwise applies variable braking force. Railroad wheels, for example, have limited traction, and friction brakes without an anti-skid system often cause skids, increasing maintenance costs and giving passengers a "thud thump" sensation.

When a modest human application force results in a braking force that is greater than usual for other brakes in the same class, the brakes are characterized as "strong." This concept of "powerful" has nothing to do with continuous power dissipation, and it may be perplexing since a brake might be "powerful" and brake forcefully with a moderate brake application, yet have a lower (worse) peak force than a less "powerful" brake.

1.3.3 Pedal feel:

The subjective impression of braking power output as a function of pedal travel is referred to as brake pedal feel. The fluid displacement of the brake and other variables affect pedal travel.Off-brake drag varies based on the design of the system to accommodate overall system compliance and deformation that occurs during braking, as well as the capacity to withdraw friction material from the rubbing surface in the off-brake state.

1.3.4 Durability:

Friction brakes have worn surfaces that need to be replaced on a regular basis. The brake shoes or pads, as well as the braking disc or drum, are all wear surfaces. There may be compromises; for example, a wear surface with a high peak force may wear rapidly.

1.3.5 Weight:

Brakes are often considered "added weight" since they provide no other use. Furthermore, brakes are often placed atop wheels, and unsprung weight may adversely affect traction in certain situations. The term "weight" may refer to the brake itself or to extra support structures.Brakes typically make a small noise when applied, but they often make loud squeals or grinding sounds.

LITERATURE REVIEW

If implemented, the Intelligent Braking Device may avoid numerous accidents and preserve human lives and property. Because the implementation of such a complicated system is often made mandatory, similar to the use of seat belts, injuries are frequently prevented to some extent. After being integrated into a single system, our Intelligent Braking Technology provides a glimpse into the long-term protection of cars, and the way in which these particular devices are more complex is also utilized to prevent accidents and safeguard car occupants [10].

DISCUSSION

Arduino is an open-source platform for the creation of electrical projects. Arduino is made comprised of a microcontroller and some software, known as an IDE (Integrated Programming Environment), which is used to create and upload code to the device's physical screen. To load

fresh programming onto the Arduino, you won't need a separate piece of hardware (called a programmer) - all you'll need is a USB connection. The Arduino IDE, on the other hand, utilizes a simplified form of C++, making it easier to learn about the program.

In a nutshell, a car brake generates friction and converts kinetic energy into heat energy by applying a static surface to a vehicle's moving surface. The high-level mechanisms are listed below. When the brakes of a moving automobile are applied, rough-texture brake pads or brake shoes are pressed against the spinning components of the vehicle, whether disc or drum. The rubbing surfaces' kinetic friction converts the vehicle's kinetic energy or momentum into heat energy, and the vehicle slows down.Static friction keeps a vehicle in place when it comes to a stop. Friction between brake surfaces, as well as friction between tires and roads, oppose any movement. To overcome the static friction that prevents the vehicle from moving, the brakes are removed. The transmission and drive system convert the heat energy of the in-engine combustion into kinetic energy, which allows the vehicle to move. The intelligent braking system is shown in Figure 1 as a drawing.

To monitor and identify the existence of an entity, ultrasound spectrum and identification of high-frequency sound wave devices are used. These devices either compute or monitor the reflection of sound waves on surfaces. When artifacts move between the transmitter and the receiver, the sound beam is disrupted. A transducer is used by the ultrasonic sensor to produce electrical output signals in response to the received ultrasonic wave. For a span of 75 meters between vehicles, the horizontal opening angle must be at least 8 degrees.

The hydraulic braking system follows Pascal's law, which states that "all pressure forces operating inside the system are acting in the same general direction." This law states that when friction is added to a fluid, it will move in a similar manner. The instructions also cover all four wheels with constant braking. The braking cylinder will feel the force at the connecting rod that enables the piston to move when the foot pedal is pressed. The fluid within the brake cylinder cavity rushes into the brake caliper, causing the pistons inside the caliper to experience fluid friction, allowing them to push the brake pad against the caliper. A braking force is applied to a rotating disc.

CONCLUSION

If implemented, the Intelligent Braking Device may avoid numerous accidents and preserve human lives and property. Because the implementation of such a complicated system is often made mandatory, similar to the use of seat belts, injuries are frequently prevented to some extent. Our Intelligent Braking Technology provides a glimpse into the long-term protection of cars, and the way in which these more complex devices are integrated into a single system is also utilized to prevent accidents and safeguard automobile occupants. The development of sophisticated technology has surpassed the long run of vehicle safety; the approach to safety is changing. The Intelligent Braking System's approach to safety is a major departure from the conventional method, yet it is essential to achieve meaningful advantages.

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