Fabrication of Intelligent Braking System Using Pneumatic Cylinder

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Abstract- *Road accidents are a commonplace in today's scenario. Accident prevention has been one of the leading areas of research. In Indian scenario normally vehicles are equipped with ABS (Anti-Lock Braking System), traction control, brake assist etc. for driver's safety. This paper focuses on a system known as 'Intelligent braking system' (IBS) which employ several sensors to respond when emergency conditions occur. The system includes an ultrasonic wave emitter provided on the front portion of the car. An ultrasonic receiver is also fitted to receive the signal. The reflected wave gives the distance between the obstacle and the vehicle. Then a microcontroller is used to detect the pulses and apply brakes to the vehicle. IBS car provides the glimpse into the future of automotive safety. By IBS system we can prevent more accidents and save more lives.*

Keywords- Pneumatic cylinder, Solenoid valve, Ultrasonic sensor, Microcontroller.

I. INTRODUCTION

Braking system is an extremely important component of a vehicle which ensures the safety of the vehicle and its occupants. In this era of multitasking people tend to divide their attention while driving on their mobile phones etc. This neglect on the part of the driver is one of the most common causes of road accidents that lead to thousands of casualties every year. So the purpose of our project is to develop a system that can apply the brakes automatically as soon as it senses any obstacle within a predefined distance. The braking system employs pneumatic cylinder and control valves to actuate the different sensors/components used in the braking system, the braking circuit and its working. The sensors included are ultrasonic sensor, ultrasonic distance measurement sensor, microcontroller. These sensors are integrated in a logical manner so as to achieve the desired braking effect. This project is designed to develop a new system that can solve this problem where drivers may not brake manually but the vehicles can stop automatically due to obstacles. The main target for this project is, cars can run automatic braking due to obstacles when the sensor senses the obstacles. The braking circuit function is to brake the car automatically after received signal from the sensor. The primary objective of this paper is to develop a safety car braking system using ultrasonic sensor and to design a vehicle with less human attention to the driving. Accidents occur due to technical problem within the vehicle or due to mistake of driver. Sometimes the drivers lose control over the vehicle and sometimes accident occurs due to rash driving. When the drivers come to know that vehicle is going to collide they become nervous and they don't apply the brakes**.** Majority of the accidents occur this way. The system designed will prevent such accidents. It keeps track of any vehicles in front. It will continuously keep the track of the distance between the two vehicles. When two come dangerously close the microprocessor in the system activates the brakes and it will stop the vehicle.

II. NEED FOR AUTOMATION

Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics form an attractive medium for low cost automation. The main advantages of all pneumatic systems are economy and simplicity. Automation plays an important role in mass production.

For mass production of the product, the machining operations decide the sequence of machining. The machines designed for producing a particular product are called transfer machines. The components must be moved automatically from the bins to various machines sequentially and the final component can be placed separately for packaging. Materials can also be repeatedly transferred from the moving conveyors to the work place and vice versa.

Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate. The manufacturing operation is being atomized for the following reasons.

- To reduce man power
- To increase the efficiency of the plant
- To reduce the work load

- To reduce the production cost
- To reduce the production time
- To reduce the material handling
- To reduce the fatigue of workers
- To achieve good product quality
- Less Maintenance
- To achieve mass production

Accidents occur due to technical problem within the vehicle or due to mistake of driver. Sometimes the drivers lose control over the vehicle and sometimes accident occurs due to rash driving. When the drivers come to know that vehicle is going to collide they become nervous and they don't apply the brakes. Majority of the accidents occur this way. The system designed will prevent such accidents. It keeps track of any vehicles in front. It will continuously keep the track of the distance between the two vehicles. When two come dangerously close the microprocessor in the system activates the brakes and it will stop the vehicle.

III. LITERATURE REVIEW

The existing approaches in preventing accidents are:

Honda's idea of ABS which helps the rider get hassle free braking experience in muddy and watery surfaces by applying a distributed braking and prevents skidding and wheel locking.

Volvo launched XC60 SUV which was equipped with laser assisted braking. This is capable to sense a collision up to 50 mps and apply brakes automatically.

Drawbacks in the existing approaches:

- ABS can only help if the rider applies it in right time manually and maintains the distance calculations. ABS has its own braking distance.
- Moreover most of the commuter bikes in India don't have ABS because it's very expensive.
- Volvo's laser assisted braking could not work effectively in rainfall and snowfall season and laser is easily affected by atmospheric conditions.

IV. FACTORS CONSIDERED

Factors considered in designing the system are:

- Braking distance
- Distance of obstacle in front.

Braking Distance

The braking distance is the main factor considered in this system. Braking distance for a particular speed is the distance between the point of application of the brakes and the point at which the vehicle comes to a complete stop from the present speed. It is calculated by using following formula.

Braking Distance = $V2 / 2\mu g$ (meter)

Where
V= Velocity of the vehicle (m/s)
μ = Coefficient of friction of road = 0.8
g = Acceleration due to gravity = 9.81(m/s2)

In this formula the condition of brakes and the road conditions are not considered for coefficient of friction μ.

Table showing braking distance:

Velocity (km/hr)	Braking distance (m)
60	17.68
50	12.38
40	7.72
30	4.58
10	0.76
5	0.16

Distance of obstacle in front

The distance of any obstacle, a parked or a moving vehicle or a road block is sensed using an ultrasonic sensor and it is fed to microcontroller.

V. CONCEPT PROPOSED

With the proposed framework these sorts of mischances can be turned away. Utilizing a ultrasonic sensor the framework will sense the rate of the vehicle and with the microcontroller, it will compute the braking separation: that is the separation required to convey the vehicle to a complete stop for that speed. Utilizing an ultrasonic sensor, the framework will sense any moving or stationary hindrance in front and ceaselessly monitor its separation.

At the point when the driver sees a deterrent in front and backs off there is no issue. Then again, in the event that he doesn't have any significant bearing brakes and continue the same velocity, he goes to a point where the separation of the impediment equivalents to braking separation. This is the last risk for the driver to apply the brake and back off the vehicle.

In the event that regardless he goes at the same speed, the microcontroller in the framework will actuate the brakes and evade an impact by conveying the vehicle to a stop.

Regularly, one would not stop at a moment that the vehicle is touching the impediment. Some separation is left before the snag. The separation is additionally accounted by the microcontroller. Assume for 50 km/hr if the braking separation is say 12.28 m, then 0.5 m is included and the braking separation is computed as 12.78m.

VI. WORKING PRINCIPLE

The ultrasonic sensor uses signals to detect the distance and the obstacle. It has a transmitter and receiver. Transmitter transmits the signals. If any obstacle interrupts that signal then it has been reflected towards the receiver. Then it gives signal to the microcontroller.

Location

This sensor is fitted in front of the vehicle. This sensor gets switched on once the vehicle is started and the sensor gives out the analog output continuously depending on the position of obstacle.

Specification

Range : 1-32 m
Signal Output : 0-5 V

Microcontroller

The whole control of the system is in the hands of ATMEGA8-16PI microcontroller. A microcontroller is a computer on a chip. It is a type of microprocessor emphasizing self-sufficiency and cost effectiveness, in contrast to a general purpose microprocessor.

Reasons behind selection

This is a low power, elite CMOS 8 bit microcomputer with 4K bytes of glimmer programmable and erasable read only memory (PEROM). The chip streak permits the project memory to be reconstructed in framework or by an ordinary non unpredictable memory developer. It is an intense microcomputer giving exceedingly adaptable and financially savvy answer for some installed control applications.

Brakes

Band brakes will be utilized for breaking the vehicle. As indicated by the most extreme velocity and the heaviness of the vehicle the band brake and the bearing required has been outlined.

Methodology

1. Development of an idea.
2. Detail study of literature.
3. Literature and System review.
4. Drawbacks in existing approach.
5. Cost estimation and specification for standard parts.
6. Experimentation.
7. Results and conclusion.

VII. CONCLUSION

From our analysis it is clear that the braking distance reduces with the use of IBS. So, we recommend the use of IBS to reduce the braking distance.

The Intelligent Braking System, if executed in auto it deflects possibilities of accidents and can spare human lives and property. Execution of such a propelled framework can be made mandatory along with wearing of safety belts with the goal that mischances can be deflected to some degree. Our Intelligent Braking System gives a look into the eventual fate of car wellbeing. The fate of car security is more than simply building up another innovation; it is moving the way to deal with wellbeing. INTELLIGENT BRAKING SYSTEM approach speaks to a huge movement from the conventional way to deal with wellbeing, yet it is crucial to accomplishing the significant advantages.

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