Automatic Braking System with Smart Battery Charging Facility

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Abstract— To ensure safe driving process, the braking system was designed and applied on a car. No. of the accidents are increases day by day due to the delay of the driver to hit the brake, so here braking system is developed such that when it is active it can apply brake depending upon the object sensed by the ultrasonic sensor and speed of vehicle which is sensed by inductive proximity sensor. The microcontroller is used to control the braking condition of the vehicle .It will based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose. Along with it, a mechanism for energy generation is developed to charge the battery. In present, vehicles are often equipped with active safety systems to reduce the risk of accidents, many of which occur in the urban environment. Similarly, this system is useful for the emergency situation.

Keywords: Automatic Braking System, Smart Battery Charging

I. INTRODUCTION

Nowadays, in case of Braking systems of commercial vehicles were always given the highest importance to safety issues and in particular active safety. Improper braking of these vehicles may cause heavy accidents due to longer stopping distances and higher energy output of brakes especially in the case of vehicle combinations. The traditional approach used for brake system (compressed air) can be now controlled with the speed and precision offered by modern electronic abilities. This system consists of ultrasonic sensor which is used to find the distance of vehicle from another vehicle in front portion of it. An inductive proximity sensor is used to calculate the speed of vehicle. Depending on distance and speed the micro controller will take the decision of braking. At the same time, the suspension system is developed for energy generation and it is stored in battery for future use. This is all about the automatic braking system.

Braking System is always used to ensure the safety of the drivers and passengers uncountable valuable lives.

II. SYSTEM SURVEY

After visiting numbers of workshops like Maruti Suzuki, Bafna Motors, Naik motors, going through detailed study of the Antilock braking from various sources such as books, internet and carefully understanding mounting of each components of ABS such as ECM, Hydraulic control module warning system got clear idea about the existing advance braking system. Workshop technicians got mixed feedback from owners of vehicles with Automatic braking system. According to drivers, they reported that they find stopping distance for normal conditions are extended by ABS either because there may be errors in the system or because of clinking or noise of ABS may contribute to driver not braking at same rate. Therefore, it is concluded that braking system present on vehicle are either so advance that they take the braking control away from driver and increase the risk factor or some of them are not that much advance to perform exactly, so we decided to make such system which can allow the driver to brake the vehicle manually at the same time system also controlling the brakes to reduce risk factors in dread situation. An ABS can be costly to maintain. Sensors are expensive and it can cost hundreds of dollars to fix on each wheel if they get out of calibration or develop other problems. So, this is a big reason behind the decline an ABS in a vehicle. Likewise, many commuter vehicles in India don't have the option of ABS because it's very expensive. It's easy to find out a problem in an ABS by messing around with the brakes. Problems include discomfort of the ABS, where a compensating brake sensor causes the vehicle to tremble, make loud noise or generally brake worse. ABS can help if the driver applies it in the right time manually and maintains the distance calculations. ABS has its own braking distance. Volvo's laser facilitate braking could not work properly in rainfall and snowfall season and laser is easily affected by atmospheric conditions. In this project we are using Ultrasonic sensors , inductive proximity sensor and Microcontroller with which the speed of the vehicle is automatically reduced and indication is given to the user when it come close to an another vehicle by automatically sensing the position of the vehicle.

III. BLOCK DIAGRAM

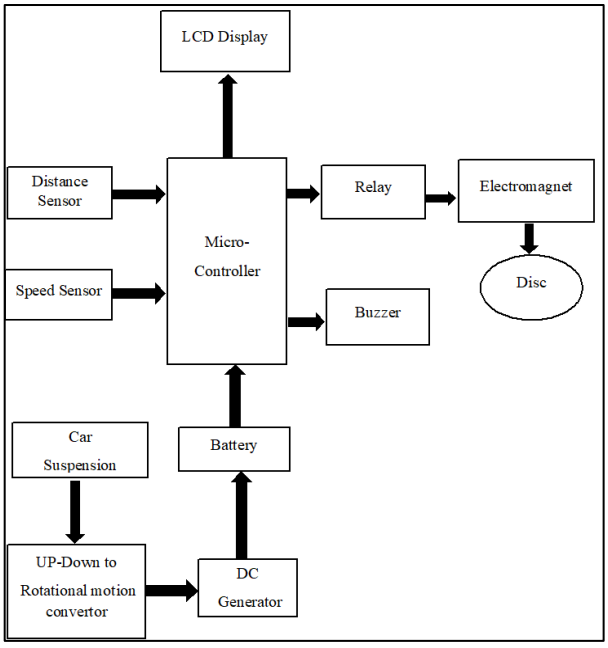

Fig. 1: Automatic Braking System with Battery Charging Facility

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IV. WORKING

The two system are designed first is Electromagnetic braking system another is energy generation using dynamo (DC generator). These two systems will be interfaced to microcontroller. Distance and Speed are applied as input to microcontroller. According to speed and distance, it will decide the condition of braking. When braking condition occurs, it will generate ABS signal and it will give the command to turn on electromagnetic braking to stop the vehicle.

A. Distance Sensor

Distance sensor consist of ultrasonic transmitter and receiver. Ultrasonic transmitter transmits the ultrasonic sound waves, these waves travel through air and strike on the target and reflected back. Then the reflected waves are received by receiver. The waves are generated if trigger pin is high for 10µs. These waves travel at speed of sound, creating 8 cycle sonic bursts that collected in Echo pin which is output pin. Echo pin remains ON for the time, these waves take to travel and bounce back. So, in this way distance sensor measures the distance of vehicle to that target by measuring the time required for emission and reception.

$$S= (v*t)/2$$

Where; S is required distance, v is speed of sound, t is time of sound waves

Fig. 2: Ultrasonic Sensor

B. Speed Sensor

Inductive proximity sensor gives pulse when metal comes in front of it. When supply is provided the electromagnetic field is produced by coil and whenever this field is disturbed by the metal object detection, then eddy current increases accordingly. By calculating how many pulses are generated in one second, the speed of vehicle can be calculated.

Fig. 3: Inductive Proximity Sensor

The output of both the sensor is applied to microcontroller that displays the speed and distance on LCD screen. It takes the decision of braking by finding the ratio of speed and distance. When braking condition occurs, ABS signal is generated to turn on relay. The electromagnet is mounted on the frame and the disc is connected to a shaft. When electricity is applied to the coil a magnetic field is created across the armature because of the current flowing across the coil and causes armature to get attracted towards the coil. As a result, it develops a torque and eventually stops the vehicle. These brakes can be implemented in heavy vehicles as an auxiliary brake. These electromagnetic brakes can be used in commercial vehicles by controlling the current supplied to produce the magnetic flux. Making some improvements in the brakes it can be used in automobiles for future use.

In energy generation system, Car suspension gives up-down motion which is converted into rotational motion in unidirectional. For this, Rack & pinion are used. Basically, it is a type of linear actuator that comprises a pair of gears which converts linear motion into rotational motion. A pinion is the circular gear and a linear gear bar called the rack, linear motion applied to the rack causes the pinion to move relative to the gear, thereby translating the linear motion of rack into rotational motion.

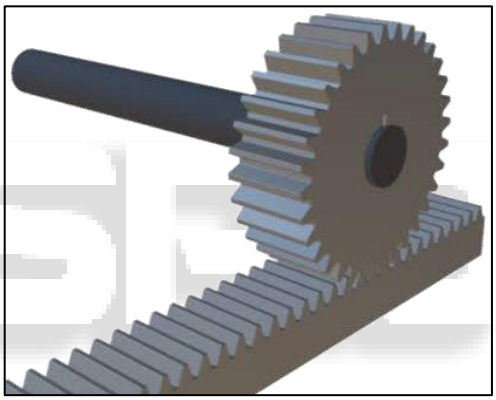

Fig. 4: Rack & Pinion

His output is applied to DC generator which generates electrical energy. This energy is used to recharge the battery of vehicle.

V. CONCLUSION

This system, if executed in auto it deflects heaps of mishaps and can saves human lives and property. Automatic braking is one of the best option which can be implemented in various applications for stopping a moving body without jerky motion.

Car suspension Energy Generation system is very efficient and useful for converting the Kinetic Energy from the movement of the vehicle, specially the suspension, which usually goes waste, to electric energy that can be used to fulfil needs of the auxiliaries in the vehicle. At present the batteries of automobiles are charged by specific alternator which is attached to IC engine shaft. Hence the fuel used in automobiles is also consumed for rotating the alternator to charge the battery, this consumption is found to be 4% of total consumption. According to newly designed suspension, current regeneration system using alternator is detached from the engine and attached to the suspension system. The advantage of this concept is energy storage system and even

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fully drained battery is charged by ultra-capacitor using high frequency charge controller system. If we install this regeneration system on all 4 wheels of vehicle, then we can generate high amount of electric power.

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