

Intelligent Braking System Using Electromagnetic Actuators

Miss. Trupti Dnyaneshwar Punekar¹, Mr. Shubham Dnyaneshwar Gadekar²,

Miss. Yukti Champalal Upase³, Mr. Shashwat Ashok Shinde⁴,

Prof. Atul B Pawar. (Guide)⁵,

DEPARTMENT OF ELECTRICAL ENGINEERING.

S.N.D. COLLEGE OF ENGINEERING & RESEARCH CENTER, YEOLA.

ABSTRACT – The accident prevention has been one of the leading areas of research today. Our paper is designed to prevent accidents due to loss of control, drunken driving, and rash driving, using circuitry aided by a microcontroller kit. This paper focuses on a system known as 'Intelligent braking system' (IBS) which employ several sensors to respond when emergency conditions occur. In our work, braking distance and the distance of the obstacle are taken into consideration along with the speed of the vehicle. The sensor detects speed of movement of the vehicle and the ultrasonic sensor senses the distance of the object in front of vehicle. These sensors provide real- time inputs to the microcontroller program. Using sensor, the system will sense the speed of the vehicle and with the microcontroller, it will calculate the distance required to bring the vehicle to a complete stop for that speed. An intelligent mechatronic system includes an ultrasonic wave emitter provided on the front portion of a car producing and emitting ultrasonic waves frontward in a predetermined distance. An ultrasonic receiver is also placed on the front portion of the car operatively receiving a reflective ultrasonic wave signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle and RPM counter gives speed of vehicle. 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 the breaking motors is incorporated to activate the brakes thereby achieving automatic breaking procedures. The system helps in conjunction with the driver judgment if the driver doesn't sense the obstacle and applies the brake at the right time then the microcontroller initiates braking motor to apply the brakes automatically. Our future work deals with incorporating real time brake shoe wear system to provide enhanced feature for the intelligent braking system.

- By looking at safety in terms of avoiding accidents in the first place.
- And then protecting occupants when a crash is unavoidable.
- We can prevent more accidents, save more lives, and reduce insurance and medical costs to society.

Key Words: Braking system, Ultrasonic Sensor, Arduinoboard, Intelligent Mechatronic system, RPM counter, Microcontroller.

1. INTRODUCTION

The braking system is the most critical system on your vehicle. Braking systems of commercial vehicles were always given the highest importance concerning safety issues and in particular active safety. Its maintenance and proper functioning are vital to you, your family and other motorists. You should not attempt to effectuate maintenance or repair work on brakes. Servicing or repairing the braking system requires specific tools and adequate technical training. That is exactly what Auto tech Performance offers you. We know Accidents occur due to technical problem within the vehicle or due to mistake of driver. 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. Braking systems of commercial vehicles were always given the highest importance concerning safety issues and in particular active safety. The traditional medium used for brake system (compressed air) can be now controlled with the speed and precision offered by modern electronic abilities. Intelligent Braking System (IBS) introduced in commercial vehicles providing rapid brake response and release for every single wheel therefore ensuring safety. The extremely rapid response time provided by the electronic control can be used for crucially shortening the braking distance by introducing advanced control of braking system operation. Such a complex task imposed to the control of braking system cannot be based on the driver abilities and need to be done independently of the driver. The advanced strategy for the braking force management, proposed here, is based on intelligent controlling of the braking forces distribution between the front and rear axle of power-driven vehicle and/or

between towing/trailer combination and/or between tractor/semi-trailer. Intelligent braking system has a lot of potential applications especially in developed countries where research on smart vehicle and intelligent highway are receiving ample attention. The system when integrated with other subsystems like automatic traction control system, intelligent throttle system, and auto cruise system, etc. will result in smart vehicle maneuver. The driver at the end of the day will become the passenger, safety accorded the highest priority and the journey will be optimized in term of time duration, cost, efficiency and comfort ability. The impact of such design and development will cater for the need of contemporary society that aspires quality drive as well as to accommodate the advancement of technology especially in the area of smart sensor and actuator. The emergence of digital signal processor enhances the capacity and features of universal microcontroller. The overall system is designed so that the value of inter-vehicle distance from infrared laser sensor and speed of follower car from speedometer are fed into the DSP for processing, resulting in the DSP issuing commands to actuator to function appropriately. The most popular systems like Antilock Braking Systems (ABS), Traction Control and Stability Control employ different types of sensors to constantly monitor the conditions of the vehicle, and respond in an emergency situation. An intelligent mechatronic system includes an ultrasonic wave emitter provided on the front portion of a car producing and emitting ultrasonic waves frontward in a predetermined distance. An ultrasonic receiver is also placed on the front portion of the car operatively receiving a reflective ultrasonic wave signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle. Then a microcontroller is used to control the speed of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose.

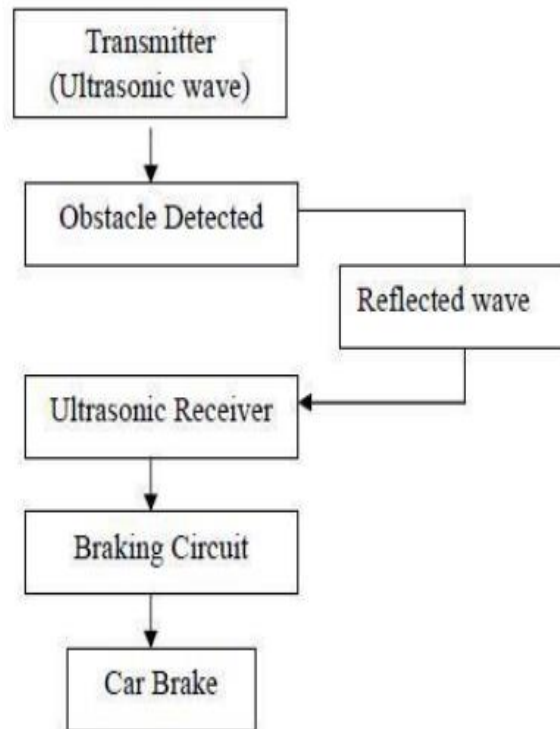
2. METHODOLOGY

A) Proposed System Methodology

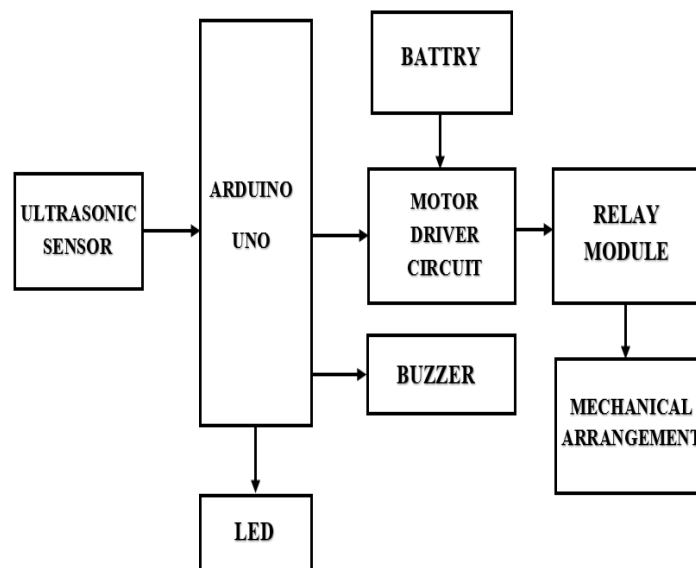
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- Development of an Idea
- Detail study of literature
- System survey
- Drawbacks in existing approach
- Cost estimation and specification for standard parts
- Load distribution analysis
- Braking force and pressure analysis
- Experimentation
- Results and discussion

B) Project Work Flow Chart



C. Block Diagram



3. CONCLUSIONS

Arduino based collision detection and warning system is designed and mounted on an RC car to demonstrate the system and it was found functional. The ultrasonic sensor was able to read distances of shorter range accurately and alert the driver if the car is in danger of collision. There were differences in the expected distance and measure distance but the system is safe. A distance sensor capable of detecting long distance is recommended for this to be applied in real vehicles. With the right materials, it is possible to improve the system features so that it can be integrated in real vehicles. The Infrared Braking System, if executed in auto it deflects heaps of mishaps and can spare human lives and property. Execution of such a propelled framework can be made mandatory like wearing of safety belts with the goal that mischance's can be deflected to some degree. Our Infrared Braking System gives a look into the eventual fate of car wellbeing and the amount more propelled this individual framework can be for staying away from mischance and ensuring vehicle tenants when they are incorporated into one framework. INFRARED 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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