Issue 1 vol 4 ISSN: 2321-8134

IJFEAT

INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

# INTELLIGENCE BREAKING SYSTEM,

**PIYUSH S. JADHAO[1], ROSHANI R. LANJEWAR[2], MALIK S. SHAIKH[3], AVINASH V. GAIKWAD[4]**

[1] *UG Student, Department of Mechanical Engineering, Jawaharalal Darda Institute of Engineering and Technology, Maharashtra,, India,* ***jadhaopiyush@rediffmail.com***

[2] *UG Student, Department of Mechanical Engineering , Jawaharalal Darda Institute of Engineering and Technology, Maharashtra, India,* ***savita3487@gmail.com***

[3] *UG Student, Department of Mechanical Engineering, Jawaharalal Darda Institute of Engineering and Technology, Maharashtra, india,* ***malikpashashekh@gmail.com***

[4] *Assistant professer, Department of Mechanical Engineering, Jawaharalal Darda Institute of Engineering and Technology, Maharashtra, india,*

## Abstract

Road accidents are common place in today's scenario. Accident prevention has one of the leading areas of research. In india normally vehicles are equipped with 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 vechile. An ultrasonic receiver is also fitted to receive signal. The reflected wave gives the distance between the obstacle and the vehicle and this wave transfer to the microcontroller by using some devices. 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 vechile stupendously for safety purpose. IBS car provides glimpse into the future of automotive safety.these IBS system we can prevent more accidents and save more lives.

***Index Terms:*** Automatic braking system, Ultrasonic sensors, Detection pulse, ABS, Microcontroller, *etc.*

---------- *** ----------

## 1.INTRODUCTION

Braking systems of commercial vehicles are always given the highest importance concerning safety issues and in particular active safety. Inappropriate breaking of vehicles may cause heavy accidents due to relatively longer stopping distances and higher energy output of brakes particularly in the case of vehicle combinations. 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 to the electronic control can be use 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. An improved the IBS braking forces management would certainly enable to reach given task. The advanced strategy for the braking force management, proposed here, are 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 lot of potential applications especially in develope countries where research on smart vehicle and intelligent highway are receiving simple attention.

## 2 METHODOLGY

An ultrasonic receiver is also placed on the front portion of the vechile operatively receiving a reflective ultrasonic wave signal. The reflected wave detected pulse are gives the distance between the obstacle and vehicle. These microcontroller is used to control the speed of the vehicle based on detection pulse information to push the brake pedal and apply the brake to the car stupendously for the safety

purpose. The extremely rapid response time are provided to the electronic control can be used for crucially shortening the braking distance introducing advanced control of braking system operation..

such complex task is imposed to the control of braking system cannot be based on the driver abilities and need to be done operated independently of the driver.

- Development of any idea
- Details study of literature
- Survay of system
- Drawbacks in an existing approach
- Cost estimation and specification for standard parts

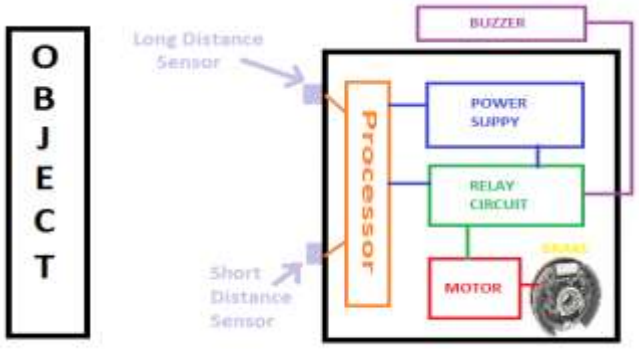


Fig 1.1 Concept layout of System

Figure 1shows concept model of project. We are trying to actuate braking system automatically.

## 3 COMPONENTS OF INTELLIGENT BRAKING SYSTEM

### 3.1 ULTRASONIC SENSOR

Ultrasonic ranging and the detecting devices make use of high-frequency sound waves to detect the presence of an object and its range. This system either measure the echo reflection of the sound waves from the objects and detect the interruption of the sound beam as objects pass between the transmitter and receiver. the ultrasonic sensor typically utilizes a transducer that produces an electrical output pulse in response to the received ultrasonic energy. In such case, the horizontal aperture angle must be at least 8 degree for an inter-vehicle distance of 75 meter. The vertical aperture are fixed to be 1 degrees and its positioned in such a way to avoid fault reading due to the road conditions.


Fig1.2 Ultrasonic Distance Sensor

## 4 ELECTRONIC CIRCUIT

Specification

1.operating voltage-12v

2.operating current-500ma

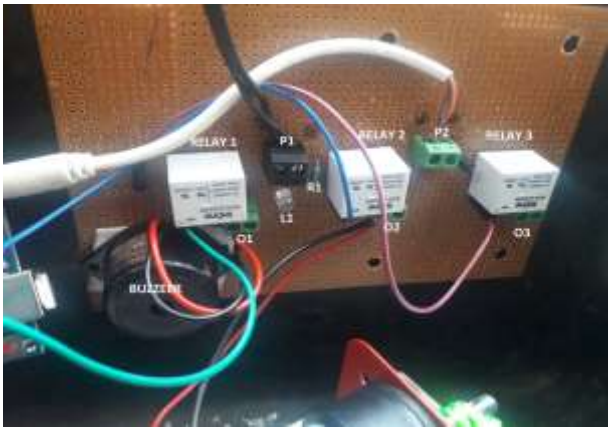


Fig1.3 Circuit Board

RELAY 1 = Relay controller to control the output (i.e.12V) of buzzer on the basis of input from microcontroller (i.e. 5V)

RELAY 2 = Relay controller to control the output (i.e.12V) of Breaking Motor on the basis of input from microcontroller (i.e. 5V)

RELAY 3 = Extra Relay Controller in case of Failure of Relay 1 OR Relay 2

P1 =Power input to the circuit from Battery Supply i.e. 12V DC

P2= Power input to the microcontroller from the circuite i.e. 12V DC

L1= Led to indicate that power supply is on for the circuit

R1= 273 Ohm Resistance for led

O1= Output from relay1

O2= Output from relay 2

O3= Output from relay 3

## 5 DC MOTOR

Specification
Voltage:12V DC
Stroke length:0.5inch
Max load current:3Amp
No load current<1Amp
RPM:150
Torque:1Nm

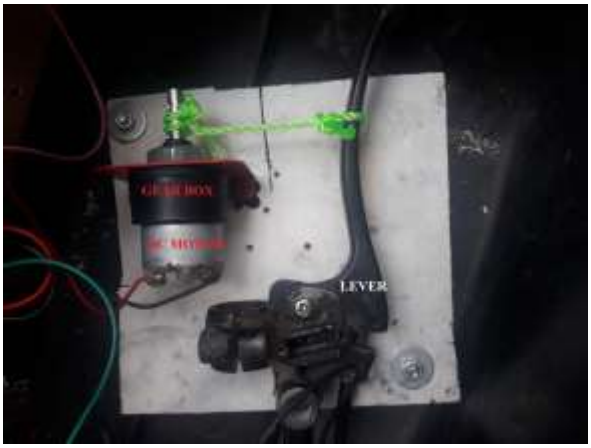


Fig1.4 Motor and Brake System

## 6 MATHEMATICAL MODELING


Fig1.5 Forces Action on Vehicle

Assumptions regarding vehicle

1. Mass of vehicle: 105 kg
2. Frictional coefficient between: 0.6
3. Frictional coefficient between Road & wheel: 0.6
5. C.G. of vehicle from ground: 0.208 meter.
6. Dia. of tire: 14 inch
7. Inner diameter of drum (D): 120 mm
8. Thickness of Drum: 20mm
9. Weight of vehicle: 1618.65
10. Wheel Base : 44 inch
11. Total weight with driver: 165kg
12. force applied by the motor: 196.2
13. brake handle leverage: 3

## 7 LOAD DISTRIBUTION ANALYSIS

Load distribution is as follows:
• 30% of total load on front wheels
• 70% of total load on rear wheels
Load on each wheel:
• On front wheel: 31.5 Kg.
• On Rear wheel: 73.5 Kg.
As the Load on The Back Wheel is much higher than that of front wheel and CG of the vehicle is closer to the back wheel we consider that there is no dynamic weight transfer in the vehicle.

### 7.1 BRAKING FORCE AND PRESSURE ANALYSIS

1) Tension in Brake wire =196.2*3 = 588.6N
   Considering no friction in the brake cable and complete Tension transmitted
2) Area of the Brake shoes = $6.702*10^{-5}$
3) Pressure on brake drum= F/A= $588.6/6.7*10^{-5}$ = 8785074.6 $N/m^2$
4) Clamping Force of the Brake Drum = $2*87.85*10^5$
   (As there are two brake shoes)
5) Total frictional force is = Clamping Force * Coefficient of friction
   = 8785 * 0.4 = 3514 N
6) Therefore Torque on the rotor
   =Frictional Force * Effective radius
   = 3514*0.067
   = 235.304 N
   The Tire Diameter = 14 inch
7) Therefore the force acting on tire
   = Torque on rotor / radius of tire
   = 235.304 / 0.3556
   = 661.70
8) Deceleration = Force/Mass =661.70/165 = 4.01 $m/s^2$
9) Stopping Distance = (Max velocity)/(2*deceleration)
   =12.22/2*4.01 = **1.52m**
10) Now stopping time of vehicle:
   V=u+at Final velocity is zero and initial is 12.22 therefore,
   t=-u/t negative sign indicate deceleration.

## 8 EXPERIMENTATION

Our future course of action is to assemble a system on vehicle & perform various experimentations by varying different parameters. Those parameters are as follows:
• Vehicle Speed

- Obstacle distance
- Sensor Position
- Varying deceleration rate

### 8.1 ACTUAL EXPERIMENTAL SETUP


Fig 1.6 Front View of Project


Fig1.7 Onboard Setup of Systeam

### 8.2 Ultrasonic Sensor position:

Fig 1.8 Side View of Vehicle

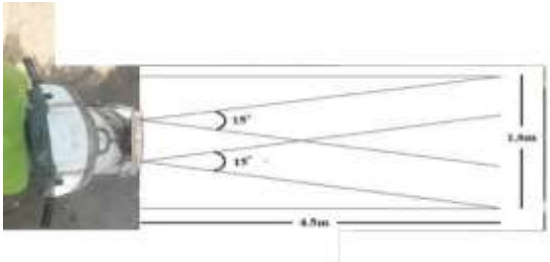

Fig 1.9 Top View of Vechile

## 9.CONCLUSIONS

This paper presents the implementation of an Ultrasonic Automatic Braking System intended to use in vehicles where the drivers may not be use brake manually, but the speed of the vehicle can be reduced automatically due to sensing of the obstacles. The ultrasonic sensors are very cheaper and the system comprises of a less demanding hardware. The relative speed of vehicle with respect to the obstacle is estimated using consecutive samples of the distance calculated. It is used by control system to calculate the action on the brakes, to adjust speed in order to maintain a safe distance to prevent accidents. This factor are coupled with the fact of lower costing and power consumption of ultrasonic sensors, could facilitate the application and mounting of the system in many low-end vehicles, thus helping to improve safety and offer a hassle free driving experience at a reduced cost. this future study and research, we hope to develop the system into an even more advanced speed control system for automobile safety, while realizing that this certainly requires tonns of work and learning, the programming and operation of microcontrollers and the automobile structure. We believe that the incorporation of the accelerator pedal disengagement mechanism will maximize safety and also give such system is bigger market space and a competitive edge in market.

## 10. REFERENCES

[1]" *Hardware Implementation of Intelligent Braking System*" Published By - S. N. Sidek and M. J. E. Salami, Faculty of Engineering, International Islamic University Malaysia.

[2] "*Intelligent Mechatronic Braking System"* Published By -. G.V. Sairam, B. Suresh, CH. Sai Hemanth, K. Krishna sai

[3] Lennon,W.K., and. Passino,K.M . " *Ieee Transaction On Control System Technology"*, VOL.7, NO.2, 1999

[4] Dr. Stephen Amell "*IDEA Program Transportation Research Board National Research Council*" ,May 31,1996

[5] C Govar , I Knight , F Okoro, I Simmons, G Coupr , P Massle, And B Smith presented "*automatic energy brake system :technical requirement , cost and benefits"* PPR 227 VERSION 1.1

[6] Aleksendric, Dragan, University of balgrade, Faculty of mechanical engineering, Automotive Department , Serbia presented paper on "*Intelligent Control Of Commercial Vehicle Braking System Function"*

.