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INTELLIGENT BRAKING SYSTEM IN FOUR WHEELERS

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Abstract: The project aims at developing a mechanism for easy braking in vehicles with less human effort. The need for such a system arises from day-to-day requirements in our society. Advanced automatic braking system improves braking techniques in vehicles.The technology of pneumatics plays a major role in the field of automation and modern machine shops and space robots. The aim is to design and develop a control system based intelligent electronically controlled automatic braking system is called **INTELLIGENT BRAKING SYSTEM (IBS)**.This project consists of Ultrasonic Transmitter and Receiver circuit, Control Unit, pneumatic braking system.The Ultrasonic Transmitter generates (0.020-20)KHZ frequency signal. The ultrasonic receiver is used to receive the reflected wave present in front of the vehicle, then the reflected waves is given to the ultrasonic wave generator unit in which the incoming wave is amplified and compared with reference signals to maintain a constant ratio and this signal is given to microcontroller and through which the working of which results in application of brakes. The ultrasonic sensor senses the obstacle. There is any obstacle closer to the vehicle (within 3-4 feet/100cm), the control signal is given to the pneumatic braking system simultaneously. This braking activation system is only activated the vehicle speed above 30-40 km per hour. This vehicle speed is sensed by the proximity sensor and this signal is given to the control unit and braking activation system. The prototype has been prepared depicting the technology and tested as per the simulated conditions. In future the actual model may be developed depending on it's feasibility.

Keywords: Ultrasonic braking system, ECU, micro controller, pneumatic cylinder.

I. INTRODUCTION

Improvement has to done in braking system in order to brake a vehicle when driver is unable to brake i.e., it may needs automatic braking system. This intelligent braking system allows the vehicle to brake without support of the driver. The main target of the ultrasonic braking system is that, vehicles should automatically brake when the sensors senses the obstacle. This is a technology for automobiles to sense an imminent forward collision with another vehicle or an obstacle, and to brake the vehicle accordingly, which is done by the braking circuit. There are several kinds of braking mechanism systems that would only can be applicable mechanically, to move the ideology more deep and brief the intelligent braking system will be more sufficient and satisfactory in addition to mechanical braking system. In present generation, number of vehicles are coming into existence with newer technologies for implementation of human comfort and other conditioning. To extend the ideology in more brief manner and to take the step in different way, may intelligent braking system would fulfill the methods of extension of technical existences.

This system includes two ultrasonic sensors viz. ultrasonic wave emitter and ultrasonic wave receiver. The ultrasonic wave emitter provided in front portion of an automatic braking system vehicle, producing and emitting ultrasonic waves in a predetermined distance in front of the vehicle. Ultrasonic wave receiver is also provided in front portion of the vehicle, receiving the reflected ultrasonic wave signal from the obstacle. The reflected wave (detection pulse) is measured to get the distance between vehicle and the obstacle. The power input is given to it from Arduino board. Then PIC microcontroller is used to control based on detection pulse information and in turn automatically controls the braking of the vehicle. Thus, this new system is designed to solve the problem where drivers may not be able to brake manually exactly at the required time, but the vehicle can stop automatically by sensing the obstacles to avoid an accident.

II. LITERATURE REVIEW

Honda's idea of ABS (Anti-lock Braking System) which helps the rider get a hassle free braking experience in muddy and watery surfaces by applying a distributed braking and prevents skidding and wheel locking. Volvo is all set to launch its new XC60 SUV which will sport laser assisted braking which will be capable to sense a collision up to 50 mph and apply brakes automatically. Going through detailed study of the ABS 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 technologies . Workshop technicians got mixed feedback from owners of vehicles with ABS. Drivers reported that they find stopping distance for regular conditions are lengthened 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

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at same rate. Hence 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 precisely, so we decided to make such system which can allow the driver brakes manually at the same time system also controlling the brakes to reduce risk factors in panic situation.

In our project we are using Ultrasonic sensors and Microcontroller using which the speed of the vehicle is automatically reduced and voice alarms are given to the user when it approaches an object by automatically sensing the position of the object/vehicle.

III. PROBLEM IDENTIFICATION

All vehicles have brakes, and they always did. Ever since man discovered the wheel, stopping it was a problem. Carts, wagons and carriages had brakes, usually simple blocks rubbing on a wheel. This established a basic that has yet to change, even with the most sophisticated brake system. All brakes use friction to stop the vehicle. An ABS can be expensive to maintain. Expensive sensors on each wheel can cost hundreds of dollars to fix if they get out of calibration or develop other problems. ABS can only help if the rider applies it in the right time manually and maintains the distance calculations. ABS has its own braking distance. For some, this is a big reason to decline an ABS in a vehicle.

1.Drawbacks in the existing approaches

• ABS can only help if the rider applies it in the right time manually and maintains the distance calculations. ABS has its own braking distance.

• Moreover many commuter bikes in India don't have the option of 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.

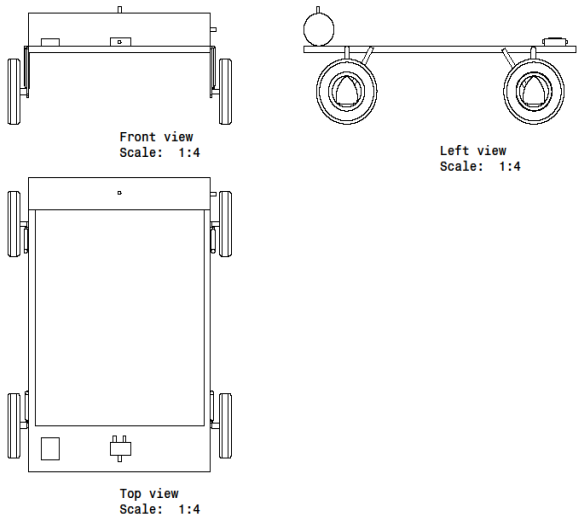

Fig 1: Different views of Intelligent Braking System

IV. WORKING METHODOLOGY

- The compressed air from the compressor at the pressure of 5 to 7 bar is passed through a pipe connected to the Solenoid valve with one input.
- The direction control Valve is actuated with Control Timing Unit.
- The Direction control valve has two outputs and one input. The air entering into the input goes out through the two outputs when the timing control unit is actuated.
- Due to the high air pressure at the bottom of the piston, the air pressure below the piston is more than the pressure above the piston.
- So these moves the piston rod upwards which move up the effort are, which is pivoted by control unit.
- The IR TRANSMITTER circuit is to transmit the Infra-Red rays.
- If any obstacle is there in a path, the Infra-Red rays reflected. This reflected Infra-Red rays are received by the receiver circuit is called "IR RECEIVER".

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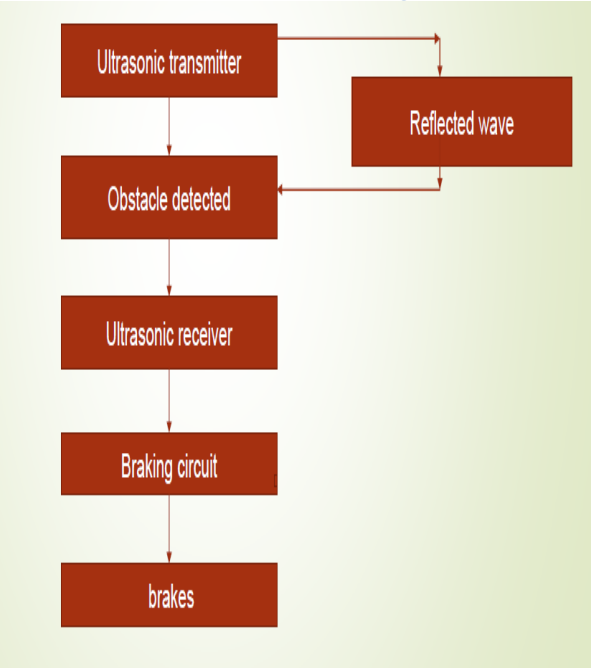

Fig 2: Working Principle

- The ultrasonic receiver circuit receives the reflected ultrasonic rays and giving the control signal to the control circuit.
- The control circuit is used to activate the solenoid valve.
- If the solenoid valve is activated, the compressed air passes to the Single Acting Pneumatic Cylinder.
- The compressed air activates the pneumatic cylinder and moves the piston rod.
- If the piston moves forward, then the breaking arrangement activated. The breaking arrangement is used to break the wheel gradually or suddenly due to the piston movement.
- The breaking speed is varied by adjusting the valve is called "Flow Control Valve".
- In our project, we have to apply this breaking arrangement in one wheel as a model.
- The compressed air drawn from the compressor in our project. The compressed air flow through the Polyurethane tube to the flow control valve. The flow control valve is connected to the solenoid valve as mentioned in the block diagram.

Fig 3: Prototype of Intelligent Braking System

V. DESIGN AND CALCULATION

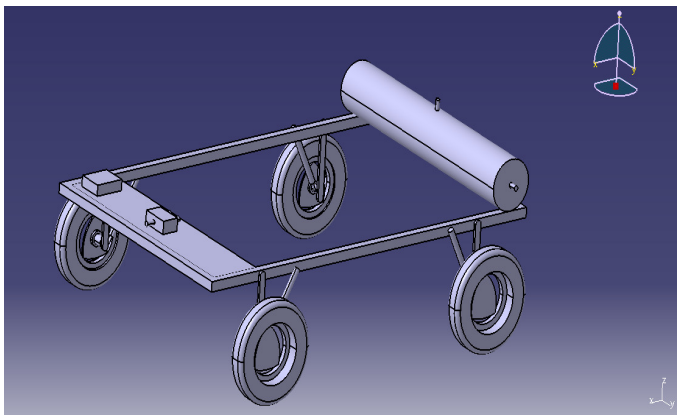

Fig 4: Design of Intelligent Braking System

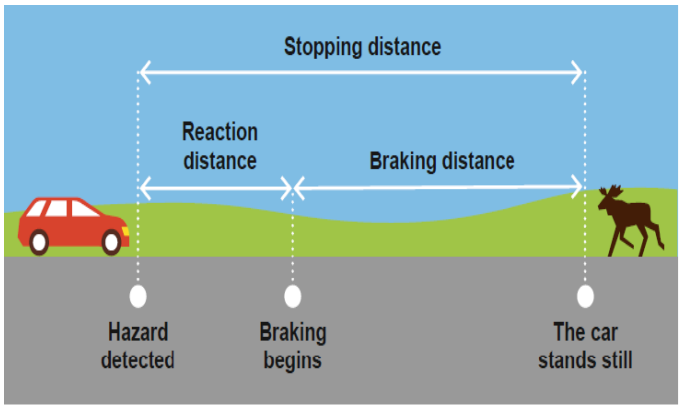

Fig 5: Calculation of Braking Distance

Stopping distance = reaction distance + braking distance
Assume,
Speed of the vechicle= 50 km
Reaction Time= 1 sec

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Reaction distance, d = (s * r) / 3.6
d = reaction distance in metres (to be calculated).
s = speed in km/h.
r = reaction time in seconds.
3.6 = fixed figure for converting km/h to m/s.
(50*1)/3.6=13.9metres reaction distance
Braking distance, D = s2 / (250 * f)
50^2 / (250 * 0.8) = 12.5 metres braking distance
Stopping distance = reaction distance + braking distance
= 13.9+12.5 = 26.4 m.

VI. ARDUINO PROGRAMMING

Arduino 1.6 software

The open-source Arduino Software (IDE) makes it easy to write code and
upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.This software can be used with any Arduino board.

The developed program for success of our project as follows:

```
#include <Servo.h> // Includes servo library.
#include <Ultrasonic.h> // Includes SR-04 Sensor Library.
Ultrasonic ultrasonic(A0,A1); // (Trig PIN,Echo PIN)
Servo servo_1; // Creating Servo object.
// declaring Motor Shield
int dataPin = 8;
int latchPin = 12;
int clockPin = 4;
int en = 7;
// Variable to store distance
int left_d = 0;
int right_d = 0;
int front_d = 0;
int max_d = 100; // Max distance to obstacle
void setup()
{
// setting up shield.
pinMode(dataPin, OUTPUT);
pinMode(latchPin, OUTPUT);
pinMode(clockPin, OUTPUT);
pinMode(en, OUTPUT);
digitalWrite(en, LOW);
servo_1.attach(10); // Attaching servo to Pin No.10
servo_1.write(90); // Initial position
delay(350);
}
void loop()
{
front_d = ultrasonic.Ranging(CM); // measuring fornt distance
if (front_d < max_d)
{
halt();
get_d();
if(right_d > max_d)
{
delay(400);
forward();
}
else if ( left_d > max_d)
{
delay(400);
forward();
}
else {
backward();
delay (500);
halt();
}
}
else{
forward();
}
}
void forward(void){ // function for forward movement.
digitalWrite(latchPin, LOW);
shiftOut(dataPin, clockPin, LSBFIRST, 3);
digitalWrite(latchPin, HIGH);
}
void backward(void){ // function for backward movement.
digitalWrite(latchPin, LOW);
shiftOut(dataPin, clockPin, LSBFIRST, 164);
digitalWrite(latchPin, HIGH);
}
void halt(void){ // function for stopping robot.
digitalWrite(latchPin, LOW);
shiftOut(dataPin, clockPin, LSBFIRST, 32);
digitalWrite(latchPin, HIGH);
}
void get_d(void) // Fuction to get distances.
{
servo_1.write(180); // Right Position
delay(3000);
right_d = ultrasonic.Ranging(CM);
servo_1.write(0); // Front Positon
delay(500);
front_d = ultrasonic.Ranging(CM);
servo_1.write(0); // Left position of servo
```

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```
delay(500);
left_d = ultrasonic.Ranging(CM);
servo_1.write(0); // back to front
delay(250);
}
```

VII. CONCLUSION

Behind the designing of this system, our main aim is to improve the prevention technique of accidents and also reducing the hazard from accidents like damage of vehicle, injury of humans, etc. We observed that our work is able to achieve all the objectives which are necessary.Thus we have developed a "**INTELLIGENT BRAKING SYSTEM**" which helps to know how to achieve low cost automation. The operating procedure of this system is very simple, so any person can operate. By using more techniques, they can be modified and developed according to the applications.

As far the commercial aspects of this product are concerned, if this product can be fully automated and produced at a lower cost the acceptance will be unimaginable.

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