AUTOMATIC BRAKING SYSTEM WITH DISTANCE ADJUSTMENT

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ABSTRACT

This paper deals with auto braking system used in automobiles to sense an imminent collision with another person ,vehicle or obstacles; or a danger such as high brakes or by applying the brakes to slow the vehicle without any driver input. Sensors to detect other vehicles or obstacles can include radar, video, infrared, ultrasonic or other technologies .GPS sensors can detect fixed dangers such as approaching stop signs through a location database. Automatic braking by the system after sensing an obstacle can be executed in two modes. In collision avoidance, the collision is avoided by the automatic braking, but the driver will not be warned in this type of system. There is a very good chance of wrongly interpreting the signals especially in the case of radar or lasers. So this is not so effective method of automatic braking. In collision mitigation system, the sensors detect the possibility of collision but will not take immediate action. A warning will be sent to the driver in the form of a signal or a voice message. There is a threshold safe distance calculated by the system and if the driver fails to respond even when the vehicle crosses that region, then only brakes will be applied automatically. Even if there is a misinterpretation o signals there is no problem because, the decision to apply brakes is left with the driver and the brakes are applied automatically only in the most emergency situations. In this project our interest is to reduce the speed or stop the vehicles automatically when the ultrasonic sensors sense collision with another person , vehicle or obstacles.

KEYWORDS: Automatic Braking System, Ultrasonic Sensors, Geared Motor, L293D.

The number of vehicles is increasing day by day and proportionally the numbers of accidents are also increasing. These accidents are mostly caused by the delay of the driver to hit the brake. To prevent the accidents caused by this delay, ultrasonic braking system is used in automobiles.

The main target of the ultrasonic braking system is that, cars should automatically brake when the sensors sense the obstacle. This is a technology for automobiles to sense an imminent forward collision with another vehicle or an obstacle, and to brake the car accordingly, which is done by the braking circuit. 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 car, producing and emitting ultrasonic waves in a predetermined distance in front of the car. Ultrasonic wave receiver is also provided in front portion of the car, 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. Then microcontroller is used to control the geared motor based on detection pulse information and the geared motor in turn automatically controls the braking of the car. 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 still stop automatically by sensing theobstacles to avoid an accident. In this system we can adjust the distance manually at which ultrasonic sensors sense the obstacle and avoid the collision.

PRINCIPAL COMPONENTS OF AUTOMATIC BRAKING SYSTEM

IR Sensor

IR sensors use infra red light to sense objects in front of them and gauge their distance. The commonly used Sharp IR sensors have two black circles which used for this process, an emitter and a detector. A pulse of infra red light is emitted from the emitter and spreads out in a large arc. If no object is detected then the IR light continues forever and no reading is recorded. However, if an object is nearby then the IR light will be reflected and some of it will hit the detector.

Ultrasonic Sensors

An Ultrasonic sensor is a device that can measure the distance to an object by using sound

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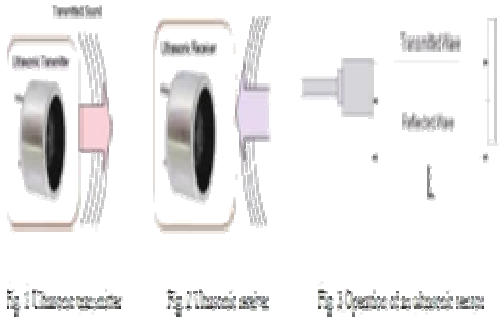
waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object. These sensors are of two types:

Ultrasonic Transmitter

Before transmitting the ultrasonic wave, transducer is used to generate the ultrasonic waves. The transducer is given a signal to intermittently produce ultrasonic waves. After that the ultrasonic transmitter sends the waves at a predetermined distance frontward. The maximum range for which obstacle can be detected depends on the range of ultrasonic sensors used.

Ultrasonic Receiver

If the ultrasonic wave detects the obstacle, it will produce a reflected wave. An ultrasonic receiver is used for receiving the ultrasonic waves reflected from the obstacle. The received ultrasonic wave is converted into a reception signal with the help of a transducer. The signal is amplified by an amplifier (operational amplifier). The amplified signal is compared with the reference signal, to detect components in amplified signal due to obstacles on the road.



Microcontroller

In this project we have used At89S52 microcontroller. It is low-power, high-performance CMOS 8-bit Atmel microcontroller. It has an on chip 8kb flash memory. The microcontroller controls the working of geared motor according to signals it receives from ultrasonic sensors.

LM358

The LM358 is an 8 pin, low power dual operational amplifier integrated circuit. It is used in detector circuits. It comprises of two operational amplifier. An operational amplifier, usually referred to as op-amp, is a high gain voltage amplifier with differential inputs and a single output. The amplifier's differential inputs consist of an inverting input and a non-inverting input. The op-amp amplifies only the difference in the voltage between the two inputs called the 'differential input voltage'. The output voltage of the op-amp is controlled by feeding a fraction of output signal back to the inverting input.

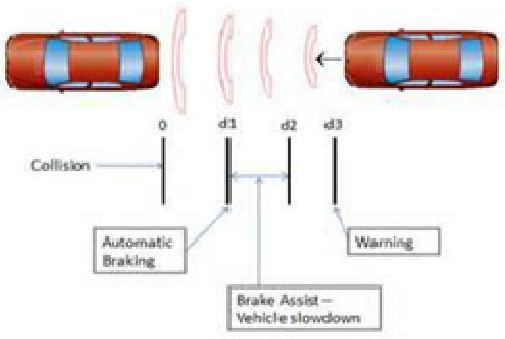
L293D

L293D is a typical Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. In this project it is used to control two geared motor . Thus with help of motor driver IC we rotate the motor in either direction.

Geared Motor

A gear motor is a specific type of electrical motor that is designed to produce high torque while maintaining a low horsepower, or low speed, motor output. The operating voltage of the geared motor used in this project is 12 volt.

PROPOSED SYSTEM

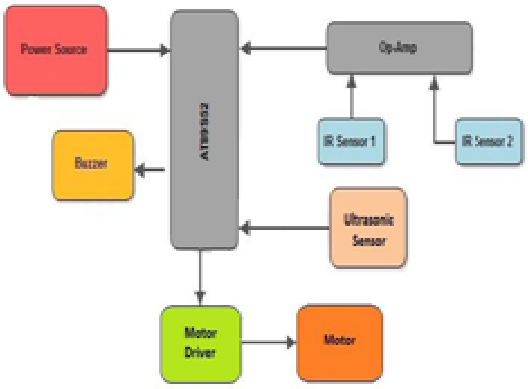


There aren't technologies to prevent accidents. But they have introduced sensors that would detect any obstacles. Besides this it also gives an alert to the driver. In this work we are enhancing the existing work by introducing automatic brakes with distance adjustment, which would get its input

from the sensors, which will then apply the brakes and prevent from collisions. This design is included with microcontroller, Ultrasonic Transmitter, Receiver, Signal conditioning unit, Driver Circuit and Mechanical arrangement. The oscillator circuit generate frequency signal continiously. It is transmitted through ultrasonic transmitter. The ultrasonic receiver is used to receive the reflected wave due to in front of the vehicle. When the adjusted distance is reached then it will warn the driver and start applying brakes. This distance can be changed according to the traffic or according to the convinence of the driver. Once the obstacle is detected the reflector will reflect the ultrasonic waves. An ultrasonic receiver receive the ultrasonic waves, reflected from the road surface to generate a receptionsignal. There is ultrasonic transducer that will transform back the sound wave to electrical energy. This signal amplified by an amplifier. The amplified signal is compared with reference signal to detect components in the amplified signal due to obstacles on the road surface. This allows the ultrasonic sensor to examine the existence of vehicles. Once this is complete the sensors give an alarm as to an obstacle detected. The processed signal will be send to the braking circuit. It also include infrared sensor in the back side of the vehicle. This sensor when detect any object while making the vehicle back then the buzzer start beep sound by making alert t othe driver. Simliar,is applicable for both right turn aswell as left turn of the vehicle.This is able to detect incidents where the speed relative to this and the distance between the target and the host suggests here that a collision is impending. At the braking circuit, brake pressures are applied here automatically. This provides maximum brake boost instantly as soon as the driver engages the brakes. This system is recognised as Automatic Braking System and it ensures full reduction in speed. The automatic braking system plays a major role in this and it is the highest escalation step for a very safety system to immediately respond to a critical incident.

BLOCK DIAGRAM

The scope of this work is to develop a safety braking system in vehicles using ultrasonic sensor and to design a vehicle with less human attention. Currently in vehicles.



In block diagram, the main part is the microcontroller (AT89S52). Remote provides input to the controller and is basically used to adjust the distance according to suitability of vehicle driver. As the distance is adjusted, ultasonic sensor starts to generate frequency and check for the adjusted distance and allow controller to operate accordingly. For this buzzer is connected to controller to produce beep sound. The rotation of the tyre is done by using gear motors for which motor driver is used. According to motor driver the direction of the tyre is decided weather to move forward, backward, right or left.

ALGORITHM STEPS

- Set the minimum distance up to which the obstacle or vehicles must be detected.
- Drive until no other vehicles reaches near you.
- Measure the distance of the obstacle from your vehicle.
- If distance is less than or equal to the assigned distance, then apply brakes, otherwise, continue driving.

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REFERENCES

G.V.Sairam, B.Suresh, CH.Sai Hemanth and K.Krishna Sai, "Intelligent mechatronic braking system", International Journal of Emerging Technology and Advanced Engineering, ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 3,Issue 4, April 13

Eung Soo Kim, "Fabrication of auto braking system for pre-crash system using sensors", International Journal of Control and Automation, Volume 2, No. 1, March 2009

Dhanya K R and Mrs R Jeyanthi, "Advanced automatic braking system with sensor fusion concept", International Journal of Emerging trends in Engineering and Development, ISSN 2249-6149, Issue 2,Volume 3 (April 2012)

Mohd.Shahrizan B. Sahri, "Ultrasonic car braking systems", University of Malaysia, Pahang.

C.Grover, I Knight, F Okoro, I Simmons, G Cooper, P Massie, B Smith (TRL Limited), "Automated emergency braking systems: Technical requirements, costs and benifits", Published Project Report PPR 227, Version: 1.1

Shival Dubey and Abdul Wahid Ansari, "Design and development of vehicle anti-collision system using electromagnet and ultrasonic sensors ", University of Petroleum and Energy Studies, India

Hai Wang and Ronghong Xiao, "Automatic car braking system– based on original reverse warning system", University of Gaevle

Blakemore T and Clancy S(1995) Braking without tradition, Transport Engineer, September 1995.