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Collision Prevention and Warning System for Vehicles

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ABSTRACT:
This paper is about the system which can be installed on vehicles to detect any obstacle in front of the vehicle and take appropriate action like slowing down or stopping the car. It also has a component incorporated to broadcast a signal to the vehicles behind it so that they can be informed about an accident. The main aim of this system is to avoid road accidents and minimize the damage in case an accident occurs.

I. INTRODUCTION

The COLLISION PREVENTION AND WARNING SYSTEM FOR VEHICLES proposes a way to decrease road accidents. Emerging wireless technologies for vehicle-to-vehicle (V2V) communications promises to reduce the various fatal roadway accidents by giving warnings.
This system detects any obstruction in front of a vehicle and stops the vehicle if needed. The measurement of distance is provided by Ultrasonic sensors that transmit and receive ultrasonic signals.
Vehicles are designed to have a smooth means of transportation based on the principles of reliability and safety however, because of reasons like human-error, circumstantial error and negligence accidents happen and many attention is taken by the technologies to reduce traffic accidents. This system is another step that can help in increasing the safety of passengers while travelling on road.
The ultrasonic system used to detect the distance is fast and the direct control of microcontroller over the vehicular motion decreases the response time in any emergency situation, thereby increasing the safety of the passengers.
This system also broadcast signal to vehicles following it in case it stops, so that those vehicles won't collide with it.

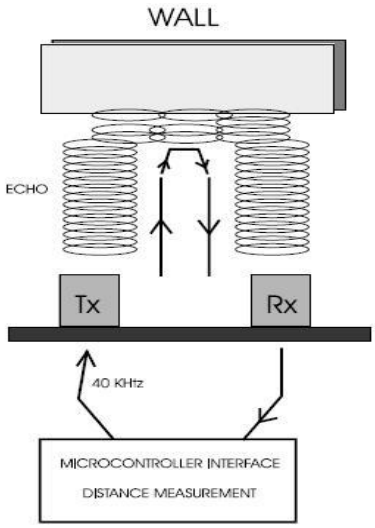
II. WORKING

This system uses ultrasonic sensors to detect the distance of an obstacle ahead of the vehicle. The ultrasonic sensors use echo signals received back to detect the range of the obstacles and display it in real-time on an LCD.
The signal received from the ultrasonic receiver is passed through a current sensor.
The central part is the microcontroller. This system uses AT89S52 microcontroller (40 Pin configuration), which is an 8 bit microcontroller with 8Kbytes of memory and 256 Bytes of RAM. It is based on EEPROM.
A critical distance is set by the driver, which can be changed using switches. Whenever the distance of the obstacle in front of the vehicle becomes equal to or less than the critical distance value set, the vehicle stops.
The system also has a RF Module connected. Its purpose is to broadcast a signal to the vehicles behind that the vehicle has stopped, so that they can also take appropriate action to avoid collision.

To prevent the system from any damage caused by generation of Back EMF from the DC motor, the wheel driver circuit is optically coupled with the rest of the circuit using Opt couplers.
For better understanding, the whole system can be divided into four blocks: Ultrasonic Sensor, Microcontroller, RF Module and Opt coupler Driving block.

A. Ultrasonic Sensor

Ultrasonic sensor is used to detect the distance of the obstacle in front of the vehicle. The sensor sends a signal and listens back for the echoes. From the received echoes, the distance of the obstacle is calculated.



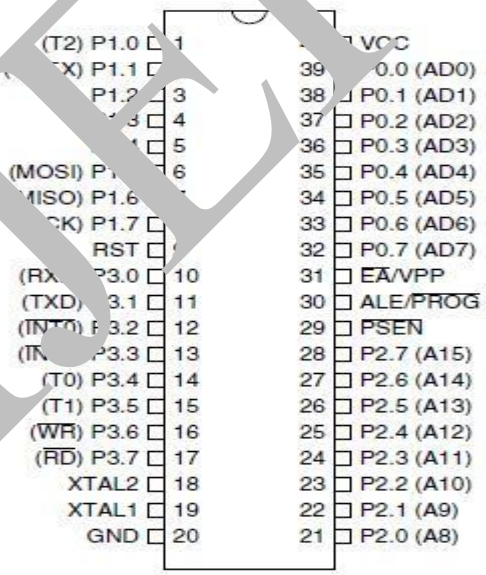
ULTRA- SONIC DISTANCE MEASUREMENT

The maximum range up to which the sensor can detect the obstacles depends upon the type of the sensor used. The sensor has to be decided keeping the required usage and cost factor in mind. The sensor that this system uses is HC-SR04 with a range of 2cm– 400cm. It can have ranging accuracy of as low as 3 mm. It sends 40 kHz signals. The distance is calculated according to the formula:

Obstacle distance = (time taken to receive echo X velocity of sound (340M/S) / 2

B. Microcontroller

Microcontroller acts as the central part of the system. AT89S52 microcontroller is used in this system. It is an 8 bit microcontroller with 8Kbytes memory and 256 Bytes RAM. 40 Pin configuration is used. It supports a large number of write erase cycles.



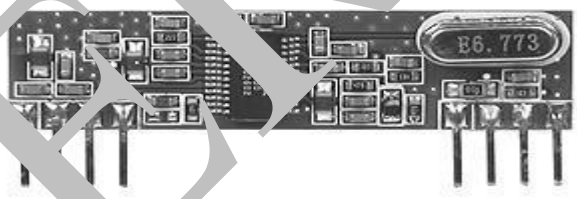
A crystal oscillator is connected to the microcontroller to provide the clock. Ceramic capacitors are connected to stabilize the frequency of oscillator.

Switches are provided to set the critical distance for the sensor. It can be increased or decreased as per the choice of the driver.
An LCD displays the distance of the obstacle in front of the vehicle and constantly updates it.
Two LEDs are also connected to indicate whether the road is clear or not. Normally the green LED will be on. If there is some obstacle in front of the vehicle within the critical distance, the red LED will switch on and the green LED.
Microcontroller takes the power supply from a battery of 9V whose output is passed through a 780 regulator, so that the microcontroller gets a constant supply of 5V and not a fluctuating input. Microcontroller is connected to the RF Module. The function of RF module is to broadcast a warning signal to all the vehicles behind about the obstruction in the road so that they can take appropriate action to avoid any accident.
Microcontroller also gives the signal to the wheels to move or stop according to the signal received from the ultrasonic sensor. The DC motor used on the wheels can produce back emf so optocouplers are used to avoid this and prevent any damage to the microcontroller and the main circuitry.

C. RF Module

RF module is used to inform the vehicles behind about the congestion on the road, so that they can stop and avoid collision. The transmitter included in the main system broadcasts a signal of 434 MHz which is received by the receivers installed on other vehicles.

Transmitter

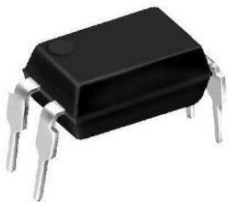


Receiver

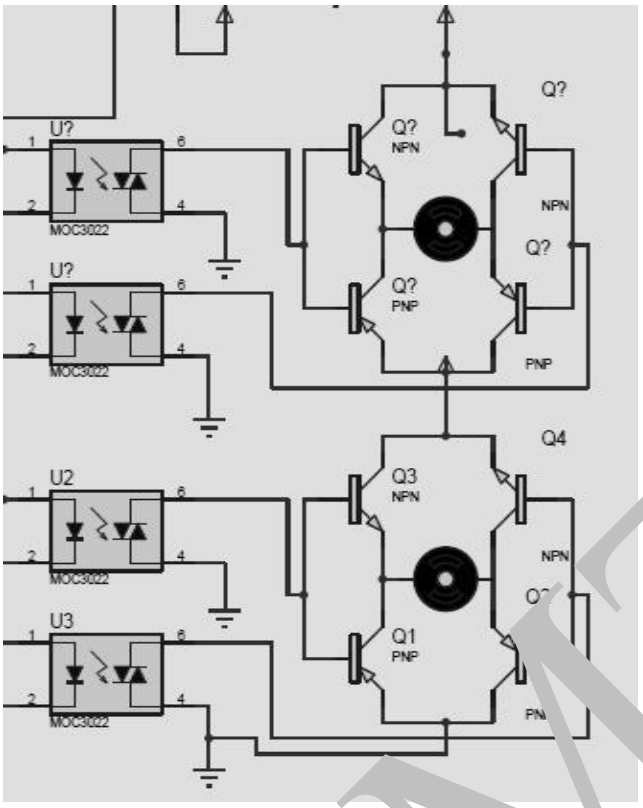
The microcontroller gives the signal in parallel form which has to be converted to serial form before it can be transmitted through the RF module. For this purpose, a set of encoder and decoder is used. At the sender end, HT12E encoder is installed, and on the receiver end HT12D decoder in installed.

D. Opt coupler Driving Block

The dc motors connected to the wheels for their motion can produce back emf, which produces risk of damage of microcontroller and the circuit. To avoid any such risk, we couple the wheels driving circuit optically by using Opt couplers.



Opt couplers consist of a LED that produces infra-red light and a semiconductor photo-sensitive device that is used to detect the emitted infra-red beam. Thus the wheel circuit is isolated from the rest of the circuit and so the risk of any damage to the microcontroller or the main circuit is over



The opt couplers supplies its output to H Bridge. The microcontroller provides the movement instruction to the motors on the wheels but it cannot provide the power required by the motors. An H Bridge enables the use of a separate power supply to power the motors.

III. FUTURE SCOPE

Instead of installing the ultrasonic sensor only in front direction, they can be installed in all the four directions. This will enable the vehicle to monitor obstacles on any side and thus will provide more security.
High power sensors can be used to provide a substantial increase in range of the sensor. The main constraints for this are budget and power supply. But if this can be achieved, the system will become more efficient.

This system stops the vehicle on detecting an obstacle within the critical distance. Improvements can be done to Firstly slow down the vehicle on an initial critical distance and ultimately stop it on a reaching a final critical distance.

IV. CONCLUSION

Nowadays, when the number of vehicles is increasing at a very high rate, it becomes essential to take steps for the safety of the passengers. This system strives to achieve this target. It will help to avoid any collision by stopping the vehicle in case of danger and informing the vehicles behind it to stop. Thus, it minimizes the chances of any damage or loss of life.

V. REFERENCES

1. Babu Varghese, Renju Thomas Jacob, Fajas Kamar and Rizwan Ali Saifudeen, "Collision Avoidance System in Heavy Traffic and Blind Spot Assist Using Ultrasonic Sensor", International Journal of Computer Science and Engineering Communications-IJCSEC. Vol.2, Issue.1, February,2014
2. T.U.Anand Santhosh Kumar, J. Mrudula, "Advanced Accident Avoidance System for Automobiles", International Journal of Computer Trends and Technology (IJCTT) – volume 6 number 2– Dec 2013
3. Niveditha.P.R and S.Gowri, "Collision Warning System using Ultrasonic Sensors and Automatic Brake System", Proc. of Int. Conf. on Recent Trends in Information, Telecommunication and Computing, ITC, DOI: 02.ITC.2014.5.106
4. Amrutha S Raibagi, Surabhi Anand B, Swetha R, "Ultrasonic anti crashing system for automobiles", International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 4, April 2013