Volume 4 || Special Issue 11 || ICCEME 2019-2020 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH
AND ENGINEERING TRENDS

VEHICLE COLLISION AVOIDANCE SYSTEM

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Abstract- As the number of vehicles increasing day-by-day, accidents are also increasing rapidly. These accidents can be due to false estimation of nearby vehicles, disturbances in mind of driver or any reasons due to which driver can't keep focus on driving. The project is based on the accident. This system can measure the distance between the driving car and front object and can calculate the safety distance of driving car based on its current speed. If driver doesn't keep the minimum safety with front object, it will warn the driver to slow down the speed of car to avoid collision. And if the driver doesn't slow down the car, this system will automatically slows down and stop the car before the collision could occur.

Keywords-- *PIC Microcontroller, Speed, Distance, L293D Motor Driver, Ultrasonic sensor, LED Display, Buzzer.*

I INTRODUCTION

Tremendous progress has been made since the 1980's with regards to vehicle safety. Improvements in passive safety features such as seat belts, airbags, crash zones, and lighting have dramatically reduced the rate of crashes, injuries and fatalities.

The introduction of Vehicle Collision Avoidance System (VCAS) represents the next significant leap in vehicle safety technology. Such systems attempt to actively warn drivers of an impending collision event, allowing the driver adequate time to take appropriate corrective actions to mitigate, or completely avoid, the event. It envisions the implementations of a comprehensive collision warning system, which is capable of detecting and warning the driver of potential hazard conditions in the forward, side and rear regions of the vehicle. The system would use: (1) long range radar or optical sensors to detect potential hazards in front of vehicles, (2) short range sensors to warn the driver of nearby objects when backing up and (3) a collision detection system to alert the driver when the vehicle deviates on the road. The program effort is focused on providing warnings to the driver rather than taking control of vehicle.

The accelerated development of strategic technologies that are the essential building blocks for fully integrated comprehensive collision warning system, has mainly focused on the following three areas: (a) sensors, (b)systems (path estimation and in-path target selection and threat assessment) and (c) human factors (driver-vehicle interfaces and understanding the effects of warning cues on drivers).

II LITERATURE SURVEY

The literature survey presents a study about how a vehicle collision is controlled by the speed control of DC motor, importance of sensors and parameters influencing the speed of vehicle in different conditions. It contains the information about the papers referred during the study of the project and the study made by the researchers on the topic and remarks given by them after the studying the work.

The researchers present that the new speed limiting system presented in their project combines several pioneering techniques that integrate wireless technologies in order to implement a reliable speed control system which can be easily implemented near different populated areas. The power of the proposed system lies in its flexibility and capability of development with little hardware changes such as changing the speed limits and speed control methods using software of base station in negligible amount of time and this system is based on microcontroller

technology for collecting data related to speed and transmitting it through a receiver to a base station that analyzes the transmitted data and takes appropriate decisions related to speed limit and control requirements[1]. They also present the vehicle monitoring system is successfully designed, implemented and tested and the entire hardware runs automatically with the help of Embedded C Programming dumped into microcontroller which calculates vehicle speed and count and displays on LCD. This project can be extended using ultrasonic sensor, GPS and GSM. By using ultrasonic sensor, we can increase obstacle sensing distance to long. By using GPS, we can get exact location of vehicle and also we can get SMS with time and date where vehicle cross the speed limit, so that we can avoid accident [2].

Some of the researchers focused on the proposed model for the speed monitoring of vehicles using wireless sensor network-based on real time localization which is based on symmetric double sided two way ranging algorithm which has the ability to zeros out the effect of clock drifts between the transmitter and receiver [3].

They also present the ISA which has very large potential to estimate accidents and reduce the severity of those that do occur. Indeed it is most powerful collision avoidance system currently available with the promise of saving accidents on all classes of road and in many if not most collision situations. There are a number of practical steps that need to taken if ISA is to be implemented, and sooner that work starts on the standards front, the sooner that the benefits can be realized. The obstacles to ISA implementation are mainly political. The vehicle manufacturing industry has a long history of opposing new safety measures in such areas as occupant protection and the prevention of injury to pedestrians. It would be a great pity if the implementation of ISA was delayed or prevented by opposition from the car industry [4].

Some are mainly focused on to develop the system to keep the vehicle secure and protect it by the occupation of intruders and to develop a system for vehicle automatic speed control and accident avoidance using Multisensors and examined how particular features of crash avoidance systems affected the number of claims under various forms of insurance coverage. They found that two crash avoidance features provide the biggest benefits:

a) Autonomous braking that would brake on its own, if the driver does not, to avoid a forward collision, and
b) Adaptive headlights that would shift the headlights in the direction the driver steers. Collision avoidance features are rapidly making their way into the new vehicle fleet [5].

Some researchers present that the collision avoidance is quantified to increase the safety of the people using the different collision avoidance techniques available. The collision avoidance measures focuses on the reduction of the collisions and fatalities of pedestrians and vehicle drivers. The objective is about describing the present scenario sensor based techniques of collision avoidance using geospatial data with their case studies on these different techniques and to identify the most appropriate techniques for collision avoidance and also visualize these techniques applicable in our Indian roads conditions [6].

III SYSTEM IMPLEMENTATION

The block diagram of the module consists of PIC Microcontroller (PIC18F4520), DC motor, and power supply block, ultrasonic sensor for detection and buzzer for alarm.

1. Ultrasonic sensor: detects the speed or direction of car or pedestrian or obstacles. The detected signal from it is forwarded to the PIC Microcontroller.
2. PIC18 Microcontroller: generates the PWM signal which is forwarded to the L293D motor driver by using duty cycle. It also generates the code to control the speed of DC motor which further controls the movement of system which is operated by it.
3. IC L293D Motor Driver: PWM signal generates by the microcontroller is forwarded to it by using duty cycle which is not directly forwarded to DC motor because the microcontroller has relatively low voltage and DC motor has high voltage. So, it is used to convert the low voltage signal to high voltage signal which is transferred to the DC motor through H-Bridge present inside the L293D motor driver.
4. Buzzer: is used to indicate the presence of obstacles or pedestrian is walking or the car is moving to control the speed of car at the right moment.
5. Infra red sensor: detects the obstacles or vehicles in side region of the car.

Following figure shows the block diagram of system below:

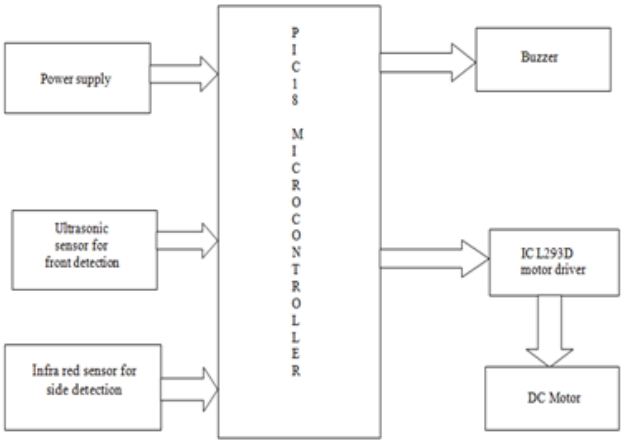


Figure 1 Block Diagram of System

Software specification:

MPLAB IDE: is a Windows-based Integrated Development Environment for the Microchip Technology Incorporated PIC Microcontroller (MCU) and dsPIC Digital signal controller (DSC) families. In the MPLAB IDE, we can:

1. Create source code using the built-in editor.
2. Assemble, compile and link source code using various language tools. An assembler, linker and librarian come with MPLAB IDE. C compilers are available from Microchip and other third party vendors.
3. Debug the executable logic by watching program flow with a simulator such as MPLAB SIM, or in real time with an emulator, such as MPLAB IDE. Third party emulators that work with MPLAB IDE are also available.
4. Making timing measurements.
5. View variables in Watch Windows.
6. Program firmware into devices with programmers such as PICSTART Plus or PROMATE II.

PROTEUS Simulation Software: is a computer simulation of Microcontrollers VSM Processors simulation bundles listed is inclusive of ISIS Professional Schematic-Capture, ProSPICE basic simulation and the PROTEUS VSM Peripheral Models Library with the advanced simulation modules of PIC, MSP430, Arduino and ARM.

III. CIRCUIT DIAGRAM

Following figure 2 shows the circuit diagram of our work is designed. In the circuit diagram of system, four input pins of two DC motors controlling IC L293D is connected to Port C of PIC microcontroller. Pins 13 and 14 are connected to crystal oscillator. The two DC motors are connected to four output pins of IC L293D motor drive. The reset circuit is connected to Vpp of Microcontroller. The ultrasonic sensor is connected to pins 36 and 37 as trig and echo on the microcontroller.

First, when the object or pedestrian comes in front of moving vehicle, the ultrasonic sensor detects the object or pedestrian. Then it detects and calculates the speed, direction of object or pedestrian. Then it sends the alert message to system and after that it verifies the identical message. After the verification of message, it re-routes the decision making strategy which leads to collision avoidance of vehicle.

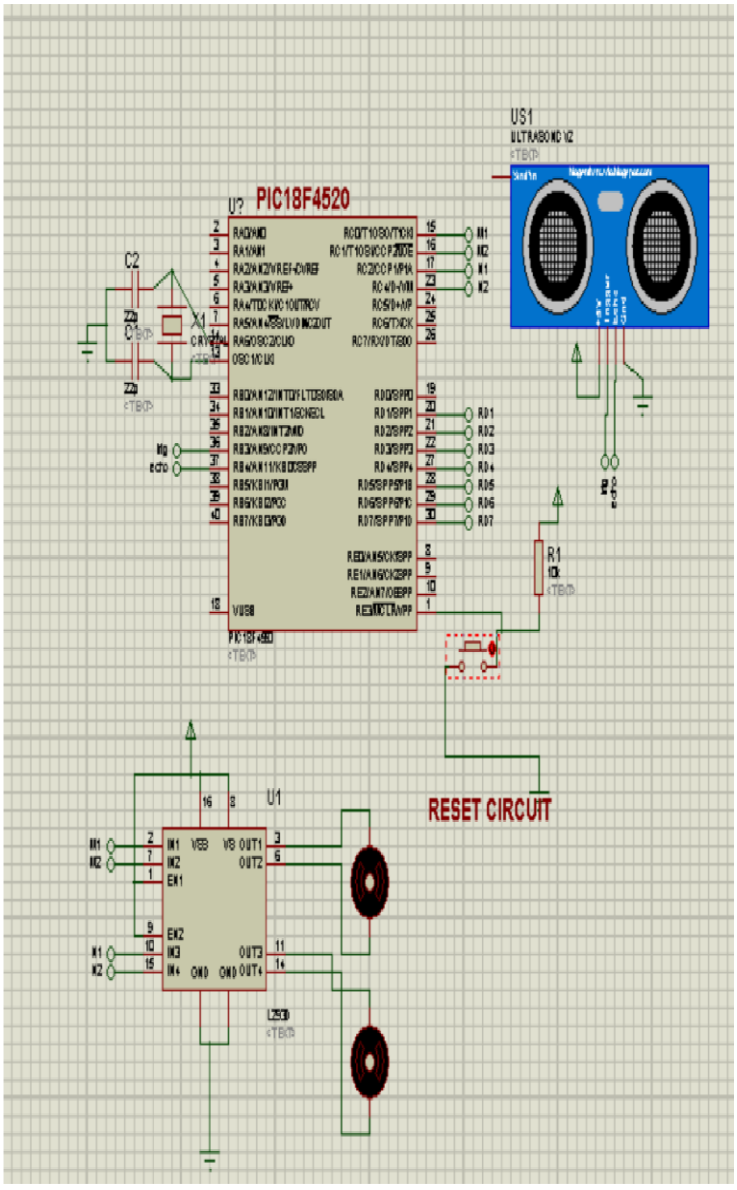


Figure 2: Circuit Diagram of System

IV FLOWCHARTS

The flowchart of system is as follows:

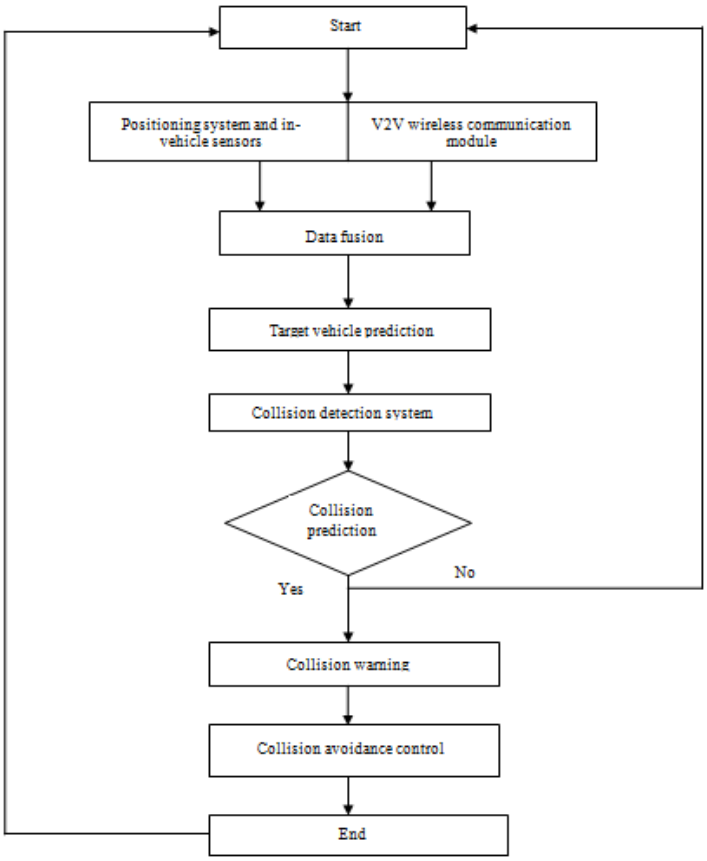


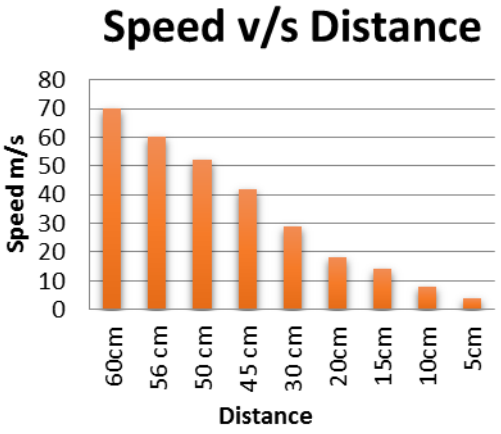
Figure 3. Flowchart

.V OBSERVATIONS AND EXPECTED RESULTS

The result of the proposed system shows that the speed of the motor is controlled by detecting the objects or obstacles at a particular distance. The table of speed v/s distance shows how the speed of car is slows down after detecting the obstacles on the road and for the system point-of-view, the distance of object from car is considered in cm and speed of car in m/s.

Distance of object from car	Speed of car
60cm	70 m/s
56 cm	60 m/s
50 cm	52 m/s
45 cm	42 m/s
30 cm	29 m/s
20cm	18 m/s
15cm	14 m/s
10cm	8 m/s
5cm	4 m/s

The graph based on the observations shown in the table is as shown:



From this graph, when the obstacle is about 60cm, the speed of car remains constant. As the distance of obstacle decreases below 60cm which is detected by sensor, then the speed of car slows down. As the range of obstacle decreases below 45 cm, then the car slows down more. As this distance reaches below 15cm or below, then the speed of car decreases gradually and the motor rotates very slowly and when it comes near the obstacle, it stops near the obstacle.
Therefore, the speed of DC motor is controlled over a wide range.

VI CONCLUSIONS

The design and its implementation of PIC microcontroller-based Vehicle Collision Avoidance System are effectively carried out with the advantages in providing the speed control of cars in traffic, and for the safety of cars and drivers and has proved to be more reliable and easy to operate.
This project is also shows how the speed of vehicle can be monitored by the sensors and also protect it in case of any fault and will prevent the vehicle from getting damaged and also obtained various conditions of detection of obstacles by giving different inputs to the microcontroller.

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