IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 2, March 2025

Vehicle to Vehicle Communication for Accident Avoidance System using GPS Tracking

Mr. Rathod G.G.[1], Mr. Balram Tandle[2], Mr. Rohit Karale[3], Mr. Tushar Varpe[4]
Professor, Department of Electronics & Telecommunication Engg.[1]
Students, Department of Electronics& Telecommunication Engg.[2,3,4]
Amrutvahini Polytechnic, Sangamner, India

Abstract: *V2V collisions are one of the most destructive events. Although there are many other causes of V2V accidents, driver neglects and excessive speed are the main culprits. Additionally, it appears that a lack of awareness makes it difficult to arrive at the scene of the collision in time. By reducing the frequency of accidents, the development of Internet of Things(IoT) technology can aid in the solution of this issue. In this study, a smart system that warns users, control vehicle speed, and properly warns people in the event of accidents. This device continuously monitors the distance between oncoming cars and any obstruction by using distance sensor. It will alert the driver to restrict speed and will automatically slow down the when crucial distance is approaching. It is a system that can send a warning to the police stations and be capable of identifying accidents. IOT-based vehicle safety Alert and Tracking System Research and Implementation When an accident occurs under unclear conditions, a notice alert with V2V information is delivered to the person responsible*

Keywords: Collision Avoidance, GPS Tracking, Speed Control, Vehicle to Vehicle communication

I. INTRODUCTION

Road accidents have been a major cause of loss of life and property, and the number of such accidents has been increasing every year. The major causes of these accidents are the lack of advanced safety measures in vehicles and irresponsible driving behaviour. The demand for a reliable and efficient safety system that can prevent road accidents and reduce the number of fatalities is increasing. One of the critical factors that contribute to such accidents is the delay in ambulance arrival time [7-8].

In many cases, by the time medical help reaches the accident site, it is often too late, and precious lives are lost. This delay is usually due to traffic congestion or the inability to locate the exact location of the accident. There is a need for a system that can detect collisions and drunk driving and send alerts to the concerned authorities in real-time with minimum delay. Existing safety systems can detect collisions and perform alcohol detection at vehicle start, but they do not provide a comprehensive solution to the problem. Advanced sensor technologies such as crash sensors, acceleration sensors, vibration sensors, alcohol sensors, GPS, and GSM modules where it is proposed in [6]. Whereas our proposed system can send alerts to the concerned authorities in the form of a URL that sends geographical co-ordinates. Alcohol consumption can impair a driver's judgment, coordination, and reaction time, making it extremely dangerous to operate a vehicle. While the use of alcohol sensors is becoming more common in vehicles to prevent drunk driving, they only check for alcohol consumption at the start of the vehicle [11].

This means that a driver may start driving while sober, but their alcohol levels may increase as they continue to drive, leading to dangerous situations on the road. Our proposed system can detect drunk driving in real-time and also enables the automated parking of the vehicle as a line follower robot prototype as in [10], thereby reducing the risk of accidents while parking. The V2V communication feature that has been implemented using nRF24L01 model ensures that other vehicles on the road are informed of the situation [9], reducing the risk of further accidents. The proposed safety system provides a comprehensive solution to the problem of road accidents and can significantly reduce the number of fatalities caused by such accidents.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 2, March 2025

Need of Project:

Every year, approximately 1.35 million people die as a result of road accidents. Because of these accidents, more than 20 to 50 million people suffer from non-fatal injuries. And many become disabled from these injuries. Road crashes cost USD $518 billion globally, costing individual countries from 1-2% of their annual GDP [1]. The challenge is to reduce the number of accidents. For which, it's better to take action before an accident occurs. But sometimes it's not in our hands. And so, many injured lose their lives for not getting informed beforehand. An automated intelligent system would be the best solution considering the circumstances.

The existing solution provides assistance to passengers when an accident occurs. The injured must launch the system to request for help manually. But it would not have been possible if he/she were under critical or serious non-vital situation. There exists no system that controls vehicle speed to prevent accidents with automatic alert

II. LITERATURE SURVEY

In [1], the author proposed a an IoT-based system to reduce road accidents in Bangladesh, the system also sends an SMS alert with location data to the vehicle owner in case of an accident with unknown causes, but there may be compatibility and reliability issues in areas with poor connectivity or outdated infrastructure.

Sharanabasappa, J. N. et.al [2], discussed how IoT can help solve social problems, specifically, driving under the influence. By embedding sensors into vehicles, IoT can monitor drivers and prevent drunk driving. While this solution has potential, its effectiveness is limited by the costof implementing the technology and the willingness of individuals to adopt it.

Divi, L. K. et.al [3] determines that the accident detection system is an important tool that can potentially save many lives by quickly alerting emergency services when an accident occurs. It uses vibration and accelerometer sensors to detect accidents and also has the capability to detect alcohol in the driver's system. However, its effectiveness is limited by the availability and reliability of the network and the quality of the sensors used. Further research is needed to optimize the system for real-world use.

VenkataRamani Shreya Yellapantula. et.al [4] examined V2V technology for improving heavy road vehicle safety, but limitations include complex traffic environments and the impact of latency on collision avoidance algorithms. The study suggests a variable time headway and minimal impact of latency on vehicle spacing, but further research is needed to evaluate effectiveness in diverse traffic scenarios and preventing collisions with non-motorized road users.

Ghatwai, N. G. et.al [5] observed the use of wireless communication technologies for vehicular networks can greatly improve road safety and efficiency. This paper presents an implementation of a complete vehicle-to-vehicle communication system and a blind spot detection system using ultrasonic sensors, Raspberry Pi, RF modules, and GPS modules. Limitations include the need for further testing in complex traffic environments and the high implementation costs.

In the paper [6], [7] the authors developed a proposal to increase road safety is the drowsiness and accident detection system, which utilizes sensors like vibration, heartbeat rate, and eye flicker. This system not only alerts the driver but also sends alerts to the driver's family through GPS and GSM technology in case of an accident or abnormal driver behavior. In addition, GPS technology can be used to monitor a vehicle's speed in real-time and detect accidents. When an accident occurs, the system can send the accident location, time, and speed to an Alert Service Center to improve emergency response times and potentially save lives.

Choudhury, A. et.al [8], discussed the problem of automobile accidents due to poor communication and delayed medical assistance. The proposed solution involves using an Arduino device to detect accidents, monitor the driver's heart rate, locate the accident, and send an SMS to the nearest hospital, police station, and driver's relative with a Google Maps link to the location and heart rate of the driver for the quickest arrival of medical assistance and better chances of survival.

In [9], the author describes a wireless alarm system designed for residential areas. The system is controlled by a microcontroller and uses the nRF24L01 wireless communication module for two-way transmission. The design aims to achieve frequency stability, reception, and emission integration. Users can send alarm signals through a sub-machine,

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 2, March 2025

and the host-machine receives and displays their address before sending out a warning. The system has undergone multiple experiments and has been found to be effective in timely warning users.

The paper [10] focuses on a specific type of robot, the sensor-based black line follower, which follows black lines on white backgrounds or vice versa and suggests that these robots have potential applications in industrial and domestic settings, such as transportation, delivery services, and floor cleaning. This paper outlines a simple and cost-effective circuit design for the black line follower robot and discusses its practical implementation.

III. METHOD OF DISEASE DETECTION

The block diagram of the design is shown in Figure 1.The block diagram shows the main functionality of the System. This research suggests a new approach that, whenever possible, helps prevent automobile collisions. As a result, when an accident occurs, the system notifies a responsible party. It keeps an eye on the car to gather data on the separation between two cars. The distance is measured using ultrasonic sensors. Every second, this measurement is updated. Additionally, the driver sees it via an interface. Depending on a number of conditions, including safe, slow down, brake, etc., the system sends the driver a warning. The alarm in the V2V will sound if two vehicles get too close to one another. To signal warning, a yellow led alert will be presented. When a dangerous situation arises between two vehicles, a red led alert will be displayed along with a buzzer sound.

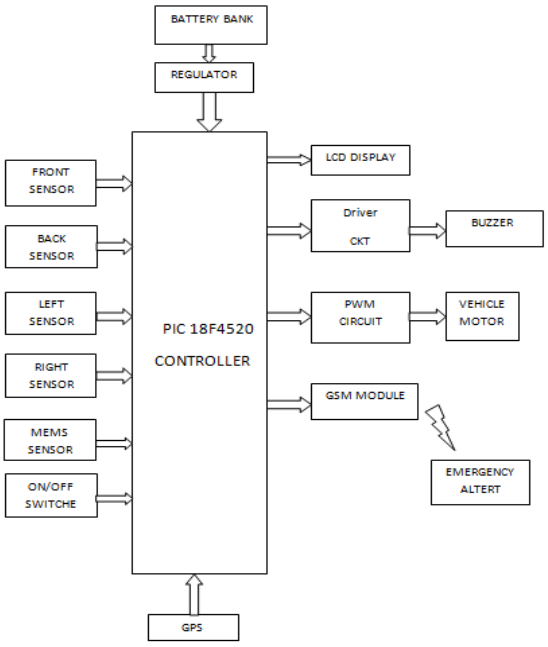

Fig. 1. Block Diagram

In this system the ultrasonic sensor is mounted on the front, backside, left and right of the car for measuring the distance between the two cars and if the distance is less then to avoid accident warning signal will be given to the driver on the LCD.. The speed sensor will monitor the speed of the car and if found high then warning will be given to the driver using an alarm.

Master is responsible for each and every action performed in the system. Master has the higher priority over slave. Master tells slave what has to be done, and take action over slave performance. Slave takes all commands from master and monitors the sensor value continuously. Finally master monitors all the operation of the system. The overall action will be continuously displayed on the display system. Ultrasonic sensor is customized to live a spot with relevance the previous car. For this subsystem, the currently available ultrasonic sensors are adopted to make sure that the distance is maintained well and based on the readout of the sensor appropriate warning signals are provided. If accident occurs then MEMS sensor detects accident and immediately sends SMS to the concerned person about location of accident.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 2, March 2025

PIC18f4520 Microcontroller

It is an 8-bit enhanced flash PIC microcontroller that comes with nano Watt technology and is based on RISC architecture. Many electronic applications house this controller and cover wide areas ranging from home appliances, industrial automation, security system and end-user products. This microcontroller has made a renowned place in the market and becomes a major concern for university students for designing their projects, setting them free from the use of a plethora of components for a specific purpose, as this controller comes with inbuilt peripheral with the ability to perform multiple functions on a single chip.

Data Memory up to 4k bytesn Data register map - with 12-bit address bus 000-FFF

Divided into 256-byte banks

There are total of F banks

Half of bank 0 and half ofbank 15 form a virtual (oraccess) bank that is accessibleno matter which bank isselected – this selection isdone via 8-bit

Program memory is 16-bits wide accessed through a separate program data bus and address bus inside the PIC18.

Program memory stores the program and also static data in the system.

On-chip External

Fig. 2. PIC 1f4520

MEMS/ADXL335 Sensor

The ADXL335 is a small, thin, low-power, complete 3-axis accelerometer with signal conditioned voltage outputs. The ADXL335 Module 3-axis Analog Output Accelerometer measures acceleration with a minimum full scale range of ±3 g.

It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. This breakout board comes with an onboard voltage regulator and works at both 3.3V & 5V (3-5V).

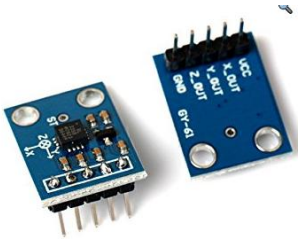

Fig. 3.ADXL335 Sensor

Ultrasonic Sensor

HC-Ultrasonic sensors work by sending out sound waves and measuring how long it takes for them to bounce back. This allows them to calculate distances and detect objects.

How they work

The sensor sends out ultrasonic sound waves at a frequency that humans can't hear.

The sound waves bounce off objects in the area.

The sensor receives the echo.

The sensor calculates how long it took for the sound waves to travel to the object and back

The sensor uses this time delay to calculate the distance to the object.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 2, March 2025

Fig. 4.Ultrasonic Sensor

GSM Module

The Sim800C GPRS/GSM Shield with Antenna provides you with a way to use the GSM phone network to receive data from a remote location，and it is compatible with all boards which have the same form factor (and pinout) as a standard Arduino Board. This shield can also be applied to DIY phones for calling, receiving and sending messages, making GPS trackers or other applications like Smart home, etc.

Fig -5: GSM Module

LCD Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD

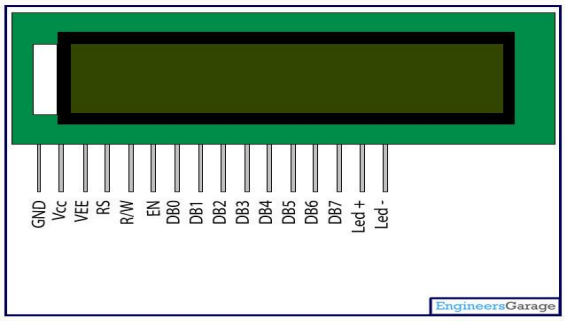

Fig. 7.LCD Display

IV. CONCLUSION

This system represents automatic braking system for accident avoidance using Vehicle-to-Vehicle (V2V) communication. Ultrasonic sensor is used to detect an object or the vehicle and to notify the system to prevent collision

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 2, March 2025

of vehicles. The microcontroller is used to control the DC motor gear through Dc motor driver and based on the vehicle, which is approaching near the reference vehicle, specific operation is carried out. If the accelerometer is affected, then an SMS will be sent to the intended user or the programmed number along with the location where the collision is prevented with the help of GPS and GSM. The interaction between the vehicles will allow following Lane discipline and acting accordingly in case of emergency situations. This system can be used to automatically reduce the speed of the vehicle when another vehicle is approaching through front end. When this system is installed in an ambulance and the vehicles around it, the ambulance is given the priority and it acts as a central hub, where it sends the message to all the vehicles around it, and this helps in clearing the traffic congestion and helps the ambulance to move forward. Since the acceleration in a vehicle is dependent on the amount of fuel injection, a switch can be made between the system, breaks and the fuel pipe. When a vehicle approaches a, the switch will be used to turn on our system and the speed will be reduced. Once the speed is reduced (for e.g., 25km/h) and the vehicle in still in front of us, even though we manually press the accelerator the speed will remain the same (which is the reduced speed) this is because the vehicle is still in front of usof things (IOT).

ACKNOWLEDGMENT

It gives us great pleasure in presenting the paper on “Vehicle-Vehicle Communication for AccidentAvoidance System using GPS Tracking”. We would like to take this opportunity to thank our guide, prof.G.G.Rathod, Assistance. Professor, Department of Electronics and Telecommunication Engineering Department,AmrutnahiniPolytechnic, Sangamner, for giving us all the help and guidance we needed. We are grateful to him for his kind support, and valuable suggestions were very helpful.

REFERENCES

[1]M. S. Fakir, N. Sakib, M. S. Mia and N. S. Sizan, "Detection, Prevention and Emergency Solution of Road Accidents in Bangladesh using IoT," 2022 International Symposium on Information Technology and Digital Innovation (ISITDI), Padang, Indonesia, 2022.

[2] Sharanabasappa, J. N. Sayed Farooq, V. N. Soundarya, V. S. Rao and K. S. Chandraprabha, "Safe Drive: An Automatic Engine Locking System to Prevent Drunken Driving," 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), Bangalore, India, 2018.

[3] L. K. Divi, N. Neelima, Y. S. K. Gudela and N. R. Palaparti, "Automatic Alcohol Sensing and Vehicle Accident Detection System using GPS and GSM," 2023 International Conference on Intelligent Data Communication Technologies and Internet of Things (IDCIoT), Bengaluru, India, 2023.

[4] V. R. S. Yellapantula, R. N. Rao and S. C. Subramanian, "Effect of Vehicle-to-Vehicle Communication Latency on a Collision Avoidance Algorithm for Heavy Road Vehicles," 2018 IEEE Intelligent Vehicles Symposium (IV), Changshu, China, 2018.

[5] E. Hossain, N. Mamun and M. F. Faisal, "Vehicle to Vehicle Communication Using RF and IR Technology," 2017 2nd International Conference on Electrical & Electronic Engineering (ICEEE), Rajshahi, Bangladesh, 2017.

[6] S. M. Gowri, P. Anitha, D. Srivaishnavi and M. Nithya, "Internet of Things based Accident Detection System," 2019 Third International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Palladam, India, 2019.

[7] M. Syedul Amin, J. Jalil and M. B. I. Reaz, "Accident detection and reporting system using GPS, GPRS and GSM technology," 2012 International Conference on Informatics, Electronics & Vision (ICIEV), Dhaka, Bangladesh, 2012.

[8] A. Choudhury, A. Choudhury and R. Nersisson, "GSM based Accelerometer Mounted Accident Detection with Location Tracking and Survivor's Condition Monitoring System," 2019 IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), Manipal, India, 2019.