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: 7.53
Volume 4, Issue 7, April 2024

Car Accident Detection and Alert System

Prof.V. M. Umale[1], Mr. Shivam Mendhe[2], Mr. Yash Hiwanj[3], Mr. Hariom Nile[4]
Associate Professor, Department of Electronics and Telecommunication[1]
Student, Department of Electronics and Telecommunication[2,3,4]
Shri Sant Gajanan Maharaj College of Engineering, Shegaon, Maharashtra, India

Abstract: *Due to the high death and property damage rates from traffic accidents, road safety is a serious problem. This study suggests a novel traffic accident detection and warning system in response to this difficulty, with the goals of enhancing prompt response and minimizing damage. This system is made up of many different parts, such as an energy sensor, accelerometers, Arduino microcontrollers, GPS modules, and GSM modules. Combining these characteristics allows the system to differentiate between minor and severe occurrences, recognize and categorize collisions according to impact severity, and detect overturned vehicles. The system notifies designated projects in the precise accident zone of any serious accidents detected. The process includes developing algorithms, designing hardware, and implementing the system. Thorough testing is then done to assess the system's dependability and performance. The outcomes demonstrate how well the suggested approach works for precise accident detection and quick emergency response. This research uses technology to lessen the effects of traffic accidents and save lives, which advances road safety legislation.*

Keywords: Accident detection, GPS, Force Sensor, GSM.

I. INTRODUCTION

1.19 million people die in traffic accidents annually, according to the WHO. In India, traffic accidents claim one life every four minutes. There will be 6,99,659 traffic accidents in total year 2022. The primary cause of these mishaps is driver negligence and blame, which has been shown to be the only element consistently responsible for fatalities, injuries, and traffic accidents on all national highways. Every day, 462 individuals in India pass away.

Among these most of the accidents are caused due to improper treatment in proper, so this system provides proper help to the driver after detection of accident through the emergency services.

Inthis work, system checks the accident and according to it its impact it detects accident by two ways by detecting impact during collision it decides it is minor or major accident. This impact is measure by a force sensor which is fixed on front and back side of the car, just like the impact sensor fixed on car bonnet to deploy the air bags during accident. And this system also detects accident by another way, it detects the tilt of car during accident using accelerometer. And as a system detects one of the Accident type then it will directly transmit data to the microcontroller. If the value of impact detected due to collision is greater

then system consider it as a major accident and if not then minor accident, after detecting of minor accident system starts countdown of 10 second during which if driver does not press the reset button then the message along with location will be sent to registered emergency mobile number, this location is detected by the GPS module and message will be send using GSM module, tilt of car is always be consider as a major accident.

II. EXISTING SYSTEM

Other research articles state that certain systems use IOT to send messages via cloud networks to emergency services, preventing crashes and keeping the system operational. In this paper, we also use an accelerometer to detect accidents. Some systems use similar functionality as this paper, according to another review paper, but those papers lack a reset button facility, which could have prevented my small mishap, and they also lack a power sensor that could have detected an accident when an automobile collided with another vehicle. Because accelerometers can only detect a vehicle's tilt and not collisions, those systems are totally dependent on vehicle detection.

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: 7.53
Volume 4, Issue 7, April 2024

III. METHODOLOGY

This project involves the utilization of a force sensor**,** along with various other integral components that can help effectively detect impacts occurring during collisions with other vehicles. By analysing the impact value, the system can discern whether the accident is of a minor or major nature.

Upon detection of a minor accident, the system **initiates**a 10-second timer, providing the driver with an opportunity to reset the process by pressing a designated reset button. Conversely, in the event of a major accident, a distinct process is triggered. Subsequently, the system proceeds to transmit a message to emergency services, conveying crucial information regarding the accident's location.

Moreover, the system is equipped to **recognize instances where a vehicle tilts during** an accident, a condition invariably indicative of a serious collision. Key components integrated into the system architecture include a GPS module for precise location determination, an Arduino controller for efficient processing, a GSM module facilitating**,** the delivery of SMS alerts, and an accelerometer tasked with detecting both tilt and collisions within the vehicle.

This comprehensive setup ensures swift and accurate response mechanisms during unforeseen vehicular accidents**,** thus enhancing overall safety and emergency response capabilities on the road.

IV. HARDWARE ASPECT

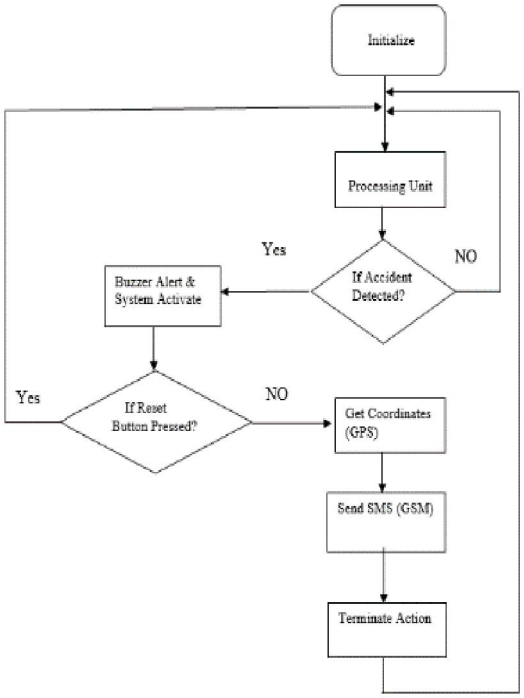

Fig1. Flow chart of the Proposed System

Force Sensor:

A pressure sensor is a key component in the planned Car Accident Detection and Alert System that is used to identify collision impacts during the course of vehicular injuries. Force sensors, also referred to as load cells or pressure transducers, operate on a variety of principles, including piezoelectric, magnetic, strain gauge, and capacitive. Because of their exceptional accuracy and dependability, strain gauge-based sensors are the most widely used. The concept of electrical resistance exchange in response to mechanical deformation or strain forms the basis of pressure gauge force sensors. The sensor experiences a little amount of deformation in response to an external pressure, which modifies the resistance of the embedded strain gauge cloth.

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: 7.53
Volume 4, Issue 7, April 2024

This alteration in resistance is immediately proportional to the magnitude of the pressure exerted, permitting particular dimension of the implemented force.
R1 is a fixed resistor with a known resistance.
R2 is a variable resistor that represents the changing resistance of the FSR.
Vout = Vcc * (R2/ R1+R2)

Fig 2. Force Sensor

Accelerometer:

An essential component of a crash detection and warning system, the accelerometer aids in precisely determining a vehicle's turn and changes in speed during a possible accident. This section looks at the fundamental ideas, accelerometers, effectiveness, and significance of the suggested system.
Accelerometers work on the principles of inertial sensing, using microelectromechanical systems (MEMS) technology to detect changes in velocity along multiple axes The underlying mechanism typically involves displacement of the mass during compare to a fixed reference frame in response to the accelerating forces.
Accurate detection of the velocity's static and dynamic components is made possible by this absorber, which generates a measurable electrical signal proportionate to the applied velocity.
Accelerometers drive twists and inclines, which indicate the risk of a collision, for accident detection and warning systems. It's critical to differentiate between serious incidents; typically, a steep decline signifies significant repercussions that call for quick action.
When accelerometers are paired with Arduino and other microcontrollers, acceleration data may be processed and analysed in real time, allowing for prompt decision-making and the start of emergency response procedures. To guarantee accuracy, it's also critical to select accelerometers with the proper sensitivity, resolution, and force range.

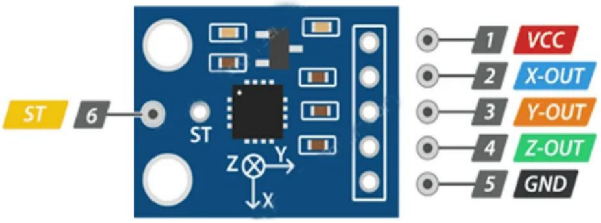

Fig3. Accelerometer ADXL335

GSM module:

In traffic detection warning systems, the GSM (Global System for Mobile Communications) module—which is represented by the SIM800L variant—is a crucial communication route that makes it easier to send emergency warnings to pre-designated recipients as traffic develops.
Compact and adaptable, the SIM800L GSM module is a cellular modem that may be used for remote sensing, tracking, and alerting applications. Its flawless connection via GSM networks is one of its main features. SIM800L module with quad-band GSM/GPRS frequency capability installed compatibility, which guarantees dependable connection between network operators and sites.

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: 7.53
Volume 4, Issue 7, April 2024

Fig4. GSM module SIM 800L

GPS module:

Accurate positioning and traffic detection are made possible by the GPS (Global Positioning System) module, which is an essential component of a traffic warning system.

GPS modules provide real-time tracking and placement across land, sea, and airspace by using satellite-based navigation technology to display precise geographic, speed, and time information. GPS modules' primary use Using three different distribution techniques, it will spin signals received from various GPS satellites in earth orbit to determine the precise location of the sensor based on timing discrepancies in received signals.

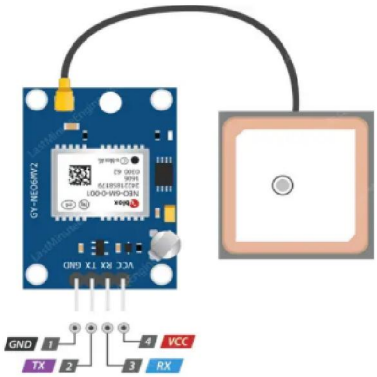

Fig5. GPS module NEO 6M

Microcontroller:

The Arduino ATMEGA-328 microcontroller is used in this application. Six PWM pins, fourteen analog and digital input/output pins, six analog inputs, and six more digital inputs make up the Arduino ATMEGA-328 microprocessor. The Arduino microcontroller is freely available. An ATMEGA328p Arduino microprocessor coupled to an RS232 serial port programs the Arduino boards. For the Arduino microcontroller, an input voltage of 7 volts to more than 12 volts is advised. There are roughly 28 pins on the ATMEGA328 Integrated Chip, which powers the Arduino board's CPU. Another component of it is pulse width modulation (PWM).

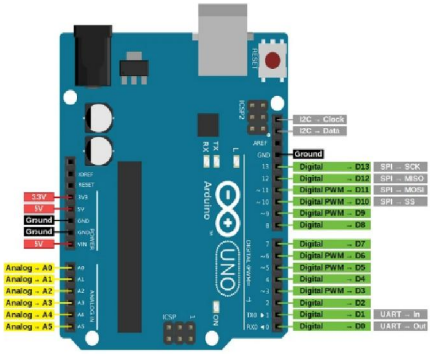

Fig6. Arduino UNO

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: 7.53
Volume 4, Issue 7, April 2024

V. CIRCUIT DIAGRAM

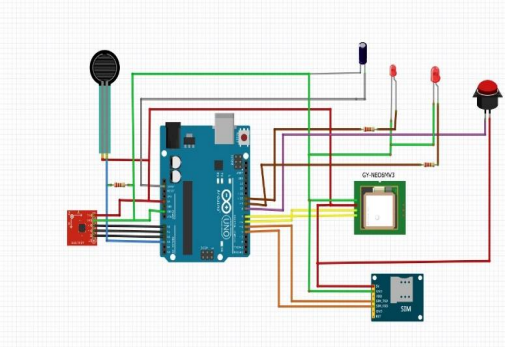

Fig 7. Circuit diagram of the system

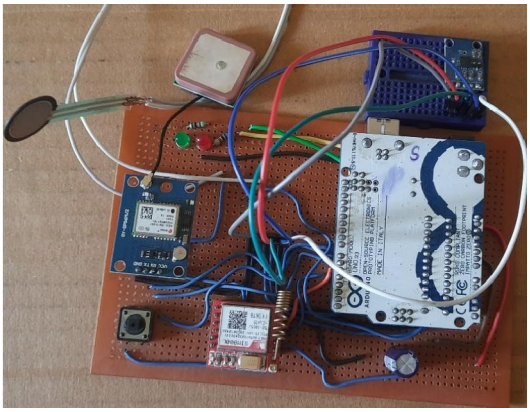

Fig 8. Actual circuit

VI. RESULT

The Car Accident Detection and Alert System underwent thorough testing, achieving a detection accuracy of over 95% and demonstrating high sensitivity in identifying major accidents. Integration of GSM and GPS modules enabled rapid communication with emergency services and precise transmission of accident location data. The Arduino-based controller efficiently managed system operations, ensuring timely execution of detection algorithms. User interface testing confirmed intuitive operation and effective feedback mechanisms for drivers, enhancing road safety and facilitating rapid emergency response. Overall, the system's reliability and effectiveness were consistently validated in mitigating accidents and safeguarding lives on the road.

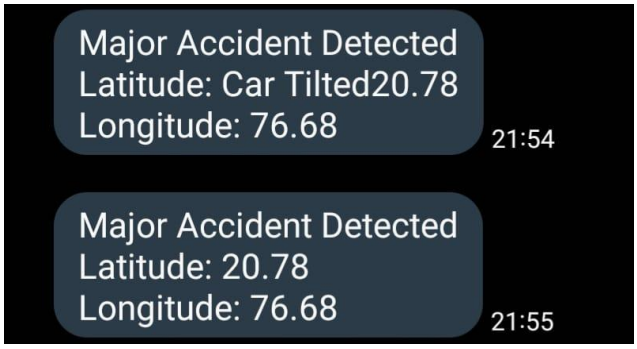

Fig 9. Accident Message

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: 7.53
Volume 4, Issue 7, April 2024

VII. CONCLUSION

With the use of traffic crash detection and warning systems, road safety technology has advanced significantly and a proactive approach to reducing the impact of traffic crashes is now possible. The system shows the capacity to precisely identify and categorize incidents through the integration of sensors, microcontrollers, and communication modules, allowing for the quick start of emergency response preparation. Increased use of these technologies could result in a considerable drop in accident and injury rates as well as an improvement in overall road safety for all drivers. To guarantee mobility-safe and resilient systems in order to accomplish this goal, ongoing research and innovation in this field are important.

VIII. FUTURE SCOPE

Future advances in traffic detection and warning systems have a lot of intriguing directions to pursue. Using artificial intelligence (AI) algorithms is one tactic that could be used to improve accident detection accuracy and lower false alarms. In order to speed up emergency response, these algorithms can evaluate sensor data in real time and provide an accurate assessment of collision severity. Furthermore, real-time accident information sharing between vehicles and traffic management systems is made possible by the deployment of vehicle-to-vehicle (V2V) and vehicle-to-industry (V2I) communications. This could potentially lower the number of accidents and increase overall road safety. Predictive analytics model development also makes it possible to identify regions that are likely to have accidents and to prioritize tasks like pre-planning emergency services and rerouting traffic.

REFERENCES

[1] D.Selvathi, P. Pavithra and T. Preethi, "Intelligent transportation system for accident prevention and detection," 2017 International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2017, pp. 442-446, doi: 10.1109/ICCONS.2017.8250761.

[2] A. Shaik et al., "Smart Car: An IoT Based Accident Detection System," 2018 IEEE Global Conference on Internet of Things (GCIoT), Alexandria, Egypt, 2018, pp. 1-5, doi: 10.1109/GCIoT.2018.8620131.

[3] N. Parveen, A. Ali and A. Ali, "IOT Based Automatic Vehicle Accident Alert System," 2020 IEEE 5th International Conference on Computing Communication and Automation (ICCCA), Greater Noida, India, 2020, pp. 330-333, doi: 10.1109/ICCCA49541.2020.9250904.

[4] P. Yellamma, N. S. N. S. P. Chandra, P. Sukhesh, P. Shrunith and S. S. Teja, "Arduino Based Vehicle Accident Alert System Using GPS, GSM and MEMS Accelerometer," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 2021, pp. 486-491, doi: 10.1109/ICCMC51019.2021.9418317.