IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Safe connect -on road Life saver

Sopan Keshav Narvate [1], Harshvardhan Vitthal Ladane [2], Dnyaneshwar Manohar kukade [3], Pradnil Ramkishan Garud [4], Gaikwad N M[5]

[1]*Student, Mechanical Engineering, Shri Shivaji Polytechnic Institute, Parbhani*

[2]*Student, Mechanical Engineering, Shri Shivaji Polytechnic Institute, Parbhani*

[3]*Student, Mechanical Engineering, Shri Shivaji Polytechnic Institute, Parbhani*

[4]*Student, Mechanical Engineering, Shri Shivaji Polytechnic Institute, Parbhani*

[5]*Professor, Mechanical Engineering, Shri Shivaji Polytechnic Institute, Parbhani*

Abstract— Road accidents are a major cause of injuries and fatalities worldwide, especially in developing countries. Delayed medical assistance is one of the primary reasons for increased mortality. The proposed system "Safe Connect – On Road Saver" is designed to provide immediate accident detection, alert generation, and real-time communication with emergency services. It integrates sensors, GPS tracking, and communication modules to ensure faster response time and improved safety. The system aims to reduce human intervention and enhance the efficiency of emergency management on roads .

Keywords: Road Safety, Accident Detection, GPS Tracking, Emergency Alert System, IoT, Smart Transportation

I. INTRODUCTION

Road safety is a major concern in today's fast-growing world, as the number of vehicles on the road is increasing rapidly. Accidents occur frequently due to factors such as over-speeding, lack of attention, poor road conditions, and delayed emergency response. One of the main reasons for the loss of lives in road accidents is the delay in providing medical assistance at the right time. In many cases, victims do not receive help immediately because no one is present at the accident location to inform emergency services. Therefore, there is a strong need for a smart and reliable system that can quickly detect accidents and inform emergency services without human intervention.

In this project, we aim to design and develop a system called "Safe Connect – On Road Saver," which focuses on automatic accident detection and instant alert generation. The system uses sensors such as accelerometers and vibration sensors to detect sudden impacts or abnormal movements of a vehicle. Once an accident is detected, a GPS module captures the exact location coordinates, and a communication module sends an alert message to emergency contacts, hospitals, or rescue teams. This process happens within a few seconds, helping to reduce response time and increase the chances of saving lives.

The system is built using simple and cost-effective components such as a microcontroller, sensors, GPS, and a GSM or internet-based communication module. It is designed to be compact, efficient, and easy to install in any vehicle. The system can also include a manual switch to cancel false alerts if no serious accident has occurred. Its portability and low power consumption make it suitable for use in both urban and rural areas where quick communication is necessary.

This project mainly focuses on improving road safety and providing a practical solution to a real-world problem. It helps in minimizing human effort and ensures that emergency services are informed automatically. The design also helps students understand important concepts such as embedded systems, sensor technology, communication systems, and real-time data processing.

In addition to its current functionality, the system can be further enhanced in the future by adding advanced features such as automatic vehicle shutdown, real-time tracking through a mobile application, cloud data storage, and integration with smart traffic systems. Artificial intelligence can also be used to improve the accuracy of accident detection and reduce false alarms. Overall, this project presents an effective and innovative approach to accident management and road safety, showing how technology can be used to save lives and improve emergency response systems..

Fig.1 : safe connect road saver,

II. LITERATURE REVIEW

Road safety and accident detection have been important areas of research due to the increasing number of vehicles and road accidents worldwide. In the early stages, accident reporting systems were completely manual, where people nearby had to inform emergency services. This process was slow, unreliable, and highly dependent on human presence and awareness. In many cases, especially in rural or isolated areas, accidents went unreported for a long time, leading to serious consequences and loss of lives.

To improve this situation, researchers introduced automated accident detection systems using basic electronic components. Early systems used vibration sensors, pressure sensors, and microcontrollers to detect sudden impacts. These systems could trigger alarms or send simple notifications. However, they lacked precision and were prone to false alerts caused by normal road disturbances such as bumps, potholes, or sudden braking. This highlighted the need for more intelligent and accurate detection mechanisms.

With the rapid growth of mobile technology, smartphone-based accident detection systems became popular. These systems utilized built-in sensors like accelerometers, gyroscopes, and GPS modules to monitor vehicle movement. When an abnormal motion was detected, the application would send an alert message to predefined contacts. Although these systems were cost-effective and easy to deploy, they had several limitations. Their performance depended on the proper placement of the phone, battery availability, and continuous internet connectivity. Additionally, users sometimes disable location services or applications, which reduces the reliability of such systems.

In recent years, IoT (Internet of Things) has played a major role in enhancing road safety solutions. IoT-based systems integrate sensors, GPS, and GSM modules to create a fully automated accident detection and reporting system. These systems can send real-time location data to emergency services without human intervention. Some advanced models also include cloud platforms for storing accident data, enabling analysis and monitoring. Researchers have also explored the use of wireless communication technologies such as Bluetooth, Wi-Fi, and LoRa for data transmission.

Furthermore, machine learning and artificial intelligence have been introduced in modern systems to improve detection accuracy. These technologies analyze patterns in vehicle movement and distinguish between actual accidents and normal driving conditions. Some systems also use cameras and image processing techniques to detect collisions visually. However, such advanced solutions require high computational power, complex algorithms, and increased cost, which limits their practical use in low-budget applications.

In addition, modern automobiles, especially high-end vehicles, are equipped with built-in safety features such as automatic crash notification systems. These systems can directly contact emergency services when a collision is detected. Despite their effectiveness, these features are not widely available in all vehicles due to their high cost and technological requirements. This creates a gap between advanced safety systems and their accessibility to the general public.

Several studies have also focused on integrating accident detection systems with emergency response infrastructure. These systems aim to notify hospitals, ambulance services, and traffic authorities simultaneously. While this approach improves coordination, it requires a well-developed communication network and infrastructure support, which may not be available in all regions.

The proposed “Safe Connect – On Road Saver” system aims to overcome the limitations of existing technologies by providing a balanced solution that is simple, reliable, and cost-effective. It uses multiple sensors to improve accuracy and reduce false alarms. The integration of GPS ensures precise location tracking, while the communication module enables instant alert generation. Unlike smartphone-dependent systems, this system works independently and provides consistent performance.

Moreover, the system is designed to be user-friendly and easy to install in different types of vehicles. It focuses on reducing response time, which is a critical factor in saving lives during accidents. The design also emphasizes low power consumption and portability, making it suitable for both urban and rural environments.

Overall, the review of existing literature indicates that although significant progress has been made in accident detection and road safety systems, there is still a need for a practical, affordable, and efficient solution. The Safe Connect system addresses these requirements by combining essential features with a simple design, making it a valuable contribution to improving road safety and emergency response systems.

III. PROBLEM STATEMENT

Road accidents have become a serious issue due to the rapid increase in the number of vehicles and traffic density. Every year, a large number of people lose their lives or suffer severe injuries because of road accidents. One of the major reasons for the high fatality rate is the delay in providing timely medical assistance to the victims. In many cases, accidents occur in remote or less crowded areas where immediate help is not available, and there is no one to report the incident to emergency services.

The traditional method of accident reporting relies on human intervention, which is often slow and unreliable. People may not notice the accident immediately, or they may hesitate to take action. Even when reported, it takes time for emergency services to reach the exact location due to a lack of accurate information. This delay can be critical and may result in the loss of lives that could otherwise be saved with quick response.

Although some modern solutions such as smartphone applications and advanced vehicle safety systems exist, they have certain limitations. Smartphone-based systems depend on user activity, internet connectivity, and proper device handling, while advanced in-built systems are expensive and not accessible to all users. Additionally, many existing systems may generate false alerts or fail to detect accidents accurately.

Therefore, there is a need for a simple, reliable, and cost-effective system that can automatically detect road accidents and immediately send accurate location information to emergency services and contacts without requiring human intervention.

IV. AIM

The aim of this project is to design and develop a compact, automatic accident detection system that integrates real-time monitoring with instant emergency communication. It focuses on providing quick and efficient response by detecting accidents and sending location details without human involvement, while reducing delay and improving safety. The system is intended to be simple, cost-effective, easy to operate, and suitable for all types of vehicles, ensuring reliable performance with minimal maintenance.

V. OBJECTIVES

The primary objective of this project is to design and develop a compact and efficient road safety system by integrating automatic accident detection with real-time emergency communication. This system enables quick identification of accidents along with immediate alert generation, eliminating the need for manual reporting and overcoming the limitations of traditional methods. It also aims to reduce response time, save lives, and improve overall road safety, especially in remote and high-risk areas.

Another key objective is to ensure accurate location tracking by using GPS technology, making it easier for emergency services to reach the accident spot without delay. The system is designed to be simple, cost-effective, and easy to implement using basic electronic components, ensuring accessibility for common users and small-scale applications. Emphasis is also placed on improving reliability by reducing false alerts and ensuring stable performance.

Additionally, the project focuses on portability, low power consumption, and ease of maintenance by using efficient components and battery support. The overall design ensures user-friendly operation, dependable performance, and adaptability for different types of vehicles, providing a practical and effective solution for accident detection and emergency response

VI. METHODOLOGY

The methodology for the development of the “Safe Connect – On Road Saver” system follows a systematic and step-by-step approach that includes design, component selection, system integration, programming, and testing. The process begins with understanding the problem of delayed emergency response in road accidents, where victims do not receive immediate help due to lack of proper communication. Based on this, the requirement of an automatic accident detection and alert system is identified. A suitable concept is then developed in which sensors, a microcontroller, GPS, and a communication module are integrated. Initial block diagrams and layouts are prepared to visualize the arrangement of components such as sensors, control unit, GPS module, and alert system, ensuring proper coordination and functionality.

After finalizing the concept, the next step involves detailed design of the system. In this stage, the working logic of sensors, threshold values for accident detection, and communication flow are defined. Basic analysis is carried out to ensure accurate detection of sudden impacts or abnormal motion. The system is designed in such a way that it can differentiate between normal vehicle movement and actual accidents. The detection mechanism is planned to respond instantly and trigger alerts without delay while maintaining stability and reliability in operation.

After the design phase, suitable components are selected. Components such as accelerometer, vibration sensor, microcontroller, GPS module, and GSM or internet-based communication module are chosen based on performance, cost, and availability. The selection process also considers factors such as power consumption, durability, ease of installation, and maintenance. The aim is to use simple and efficient components to make the system economical and practical for real-world applications.

The next stage is system development and integration. All components are connected properly, where sensors are interfaced with the microcontroller to provide continuous input data. The GPS module is integrated to obtain real-time location coordinates, and the communication module is connected to send alert messages. Proper programming is done in the microcontroller to process sensor data, detect accidents based on predefined conditions, and activate the alert system. Care is taken to ensure correct wiring, stable connections, and proper functioning of all modules.

Once the system is developed, it is assembled and installed in a suitable setup or vehicle model. All components are securely placed, and power is supplied using a battery source to ensure continuous operation. The system is then tested under different conditions to check its performance. Various parameters such as detection accuracy, response time, location tracking, and message delivery are observed. The system is also checked for false alerts, and necessary adjustments are made to improve reliability.

After testing, the final system is evaluated to ensure it meets the required objectives. Any errors or issues identified during testing are corrected through modifications in programming or hardware setup. This step ensures that the system works efficiently, provides accurate results, and delivers quick emergency alerts. Overall, the methodology ensures a reliable, effective, and practical solution for accident detection and emergency response.

VII.DESIGN CALCULATIONS

This calculation determines the total power requirement, battery capacity, and system response parameters for the Safe Connect system, which includes sensors, microcontroller, GPS, and communication module.

Assumptions:

Voltage supply (V) = 5 V

Current of microcontroller = 50 mA = 0.05 A

Current of GPS module = 45 mA = 0.045 A

Current of GSM module = 200 mA = 0.2 A

Current of sensors = 20 mA = 0.02 A

Efficiency (η) = 0.8

Operating time = 2 hours

Signal delay time = 5 seconds

Step 1: Total Current Calculation

$I = I_1 + I_2 + I_3 + I_4$

I = 0.05 + 0.045 + 0.2 + 0.02

I = 0.315 A

Step 2: Power Consumption

P = V × I

P = 5 × 0.315

P = 1.575 W

Step 3: Energy Requirement

E = P × t

E = 1.575 × 2

E = 3.15 Wh

Step 4: Battery Capacity Calculation

Battery capacity (Ah) = E / V

Battery capacity = 3.15 / 5

Battery capacity = 0.63 Ah

Step 5: Considering Efficiency

Actual Battery Capacity = 0.63 / 0.8

Actual Battery Capacity = 0.787 Ah

≈ 0.8 Ah

Step 6: Selection of Battery

Selected battery = 5V, 1 Ah (minimum recommended for safe operation)

Step 7: Power Distribution Calculation

Power of microcontroller = 5 × 0.05 = 0.25 W

Power of GPS module = 5 × 0.045 = 0.225 W

Power of GSM module = 5 × 0.2 = 1 W

Power of sensors = 5 × 0.02 = 0.1 W

Total power = 1.575 W

Step 8: System Response Time

Total response time = Detection time + Processing time + Communication time

Detection time ≈ 1 sec

Processing time ≈ 2 sec

Communication time ≈ 5 sec

Total response time ≈ 8 seconds

Step 9: Efficiency Check

Output Power = 1.575 × 0.8

Output Power ≈ 1.26 W

Findings:

Total current (I) = 0.315 A

Power consumption (P) = 1.575 W

Energy required (E) = 3.15 Wh

Required battery capacity = 0.8 Ah

Recommended battery = 5V, 1 Ah

System response time ≈ 8 seconds

Output power = 1.26 W $\tau = 0.001$

Step 10: System Efficiency Verification

η = (Output Power / Input Power)

$\eta = 1.26 / 1.575$

$\eta \approx 0.8$

Findings (Additional):

System efficiency (η)

RESULTS AND DISCUSSION

We successfully built and tested a manually operated rotary conveyor system that can move materials horizontally and rotate 360 degrees. The conveyor belt and pulley system worked smoothly, and the DC motor was able to handle light to medium loads easily. The manual rotation mechanism allowed the conveyor to turn in 45-degree steps, and the four-wheel support kept the system stable with very little vibration.This system is flexible compared to regular fixed conveyors because it can send materials to different directions without extra equipment. Its compact design also saves space, making it suitable for workshops or small industries. While it works well for small loads, heavier materials may need a stronger frame and motor. Overall, the project shows that a simple manual rotary conveyor is easy to use, efficient, and cost-effective.

CONCLUSION

provides an effective solution to improve road safety by enabling automatic accident detection and instant alert communication. The project successfully demonstrates how sensors, GPS, and communication modules can be integrated to detect accidents and send real-time location information to emergency contacts. This helps in reducing the response time and increases the chances of saving lives during critical situations.

The system is simple, cost-effective, and easy to implement, making it suitable for different types of vehicles and real-world applications. It minimizes the need for human intervention and ensures reliable performance through continuous monitoring. The use of basic components and efficient design makes the system practical and accessible for common users.

Overall, the project achieves its objective of providing a smart and reliable road safety solution. With further improvements and addition of advanced features, the system can be made more accurate and suitable for large-scale implementation, contributing significantly to accident prevention and emergency response systems.

REFERENCES[1] S. Kumar and R. Patel, “IoT based accident detection and alert system,” Int. J. Eng. Res. Technol., 2017.

[2] M. Sharma and A. Singh, “Accident detection using GPS and GSM,” IEEE Trans., 2018.

[3] A. Rajput and S. Verma, Embedded Systems, Wiley India, 2016.

[4] W. K. Chen, Linear Networks and Systems, Wadsworth, 1993.

[5] P. G. Shinde and S. R. Patil, “Vehicle accident alert system,” Int. J. Innov. Res., 2018.

[6] A. H. Esmaeili et al., “Smart accident detection using IoT,” Int. J. Adv. Eng., 2019.

[7] H. R. Parsai, Intelligent Transportation Systems, PHI Learning, 2015.

[8] J. Williams, “Design of vehicle tracking systems,” Harvard Univ., 2015.

[9] N. Kawasaki, “GPS based navigation systems,” Osaka Univ., 2014.

[10] S. Bingulac, “Sensor-based monitoring systems,” Proc. Embedded Conf., 2010.

[11] W. Doyle, “Accelerometer-based motion detection,” IEEE Sensors Conf., 2012.

[12] R. Scholtz, “Wireless communication techniques,” IEEE Press, 2005.

[13] G. Young, “Modern electronic communication systems,” McGraw-Hill, 2001.

[14] J. Wilkinson, “Electronic system standards,” ANSI, 1968.

[15] R. Vidmar, “Wireless communication in emergency systems,” IEEE Trans., 2016.