IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.134134

INTELLIGENT VEHICLE SAFETY SYSTEM

Vasudeva Hegde[1], Prathamesh[2], Vaishnav[3], Vedant[4]

Computer Science and Engineering, Dayananda Sagar University, Bangalore, India[1-4]

Abstract: In response to growing safety concerns and increasing accidents and traffic violations, our project offers an advanced solution that combines sensor-based technology, machine learning algorithms and GPS technology to create a powerful system to solve the accident and traffic problem. Violation of the law. The main aim of the project is to create an integrated system that will not only detect incidents in a timely manner, but also manage emergency responses and reduce their impact.

The proposed system uses state-of-the-art sensors to continuously monitor multiple vehicles and can detect anomalies that indicate an accident. Using machine learning algorithms, the system analyses this data to distinguish between driving behavior and situations that require intervention. The addition of GPS technology increases the accuracy of the system, provides accurate location information, and provides instant alerts to drivers and authorities.

The general purpose of the project is not only accident research; It aims to contribute positively to improving road safety, thus saving lives, and reducing industrial accidents and damage to the environment. The system's ability to quickly detect and react to traffic violations also plays an important role in improving overall road discipline and reducing the risk of accidents.

This demonstration aims to investigate the effectiveness of GPS-based collision avoidance, providing a better path to road safety. This innovation, which meets the need to be more efficient in accident and crime investigations, is not only based on modern technology, but also has a social and environmental purpose, being an important step towards safety and better transportation.

The system integrates GPS data collection, vehicle speed monitoring, slope detection and other functions to instantly detect and react to situations. Geo-integration and Google Maps integration improve accuracy and user experience. Machine learning algorithms can identify the situation and trigger SMS alerts and alerts for quick response.

Audio output and LCD screen provide immediate warning to the driver and impress the user. The system's cost efficiency, reliability and scalability allow it to adapt to different vehicles. Live monitoring provides instant feedback, while coordinated emergency response minimizes the impact of an incident. As a result, this new solution uses advanced technology to create a social, simple, efficient and effective crime prevention system and ultimately improve the safe road.

Keywords: Vehicle safety, CNN, yolo, GSM, CCTV, Blind spot detection, ADXL, ADAS.

I. INTRODUCTION

Road accidents and traffic violations are major concerns for public safety. In recent years, there has been a growing interest in using sensors and machine learning to detect and prevent such incidents in real-time.

This project explores the implementation of an accident and detection system using sensors and machine learning algorithms. This presentation introduces a GPS-based accident prevention system designed to monitor, warn, and respond to potential accidents in real-time. The system addresses the need for better road safety and contributes to societal and environmental benefits.

The system uses the latest technology to create a consistent and efficient system and investigate traffic violations. Using GPS data collection as a bone of the body clarifies the vehicle's movement and location. This information is seamlessly integrated into the algorithms, making it easy to monitor the vehicle's speed at any time.

The system can detect the difference between bad driving by constantly monitoring the vehicle, and as a result, risks can be intervened immediately.

DOI: 10.17148/IJARCCE.2024.134134

Slope detection technology further increases the body's ability by instantly detecting slopes or rollovers. This capability is necessary to identify conditions that indicate a condition and allow the system to respond appropriately. Integration of georeferencing calculation allows the system to not only identify potential events but also display their location on the map. This information is seamlessly integrated with Google Maps, providing a user-friendly interface that improves access to the system and a visual representation of potential risks.

Accident detection forms the basis of the system and relies on machine learning algorithms to analyze sensor data and distinguish between normal driving and emergency accidents. When an accident or traffic violation is detected, the system sends an urgent SMS alert to departments and stakeholders to facilitate rapid coordination and immediate response

The warning system creates an additional layer of safety by providing audio output and an LCD screen to ensure immediate warning to the driver. The user-friendly interface improves access to the system for drivers and emergency personnel, making it more efficient and comprehensive. The integration of these technologies not only improves safety, but also creates an effective collision avoidance system that provides a reliable and scalable platform that can be adapted to different situations.

Real-time monitoring is the foundation of accident prevention. The system provides rapid feedback and has the ability to intervene. The scalability of the system allows seamless integration with existing traffic management, allowing the system to adapt to different geographical and traffic conditions. Additionally, the system's collaborative problem-solving capabilities enable rapid and effective response to incidents, reducing the impact on people and the environment. Overall, the combination of these technologies leads to powerful and innovative solutions that solve many problems related to road safety and traffic management.

II. LITERATURE SURVEY

1.1 Optimal arrangement of sensors for traffic accidents and prevention (2022):

This study focuses on the optimal arrangement of sensors for traffic accidents and prevention. The literature surrounding this topic highlights the importance of sensor placement in improving the performance and accuracy of collision detection systems. Various studies have investigated different technologies such as cameras, accelerometers and radar, taking into account factors such as coverage, redundancy and cost effectiveness. Optimization algorithms for determining sensor placement are discussed, highlighting the importance of generalization and minimizing blind spots. Additionally, this form can be entered into research data or simulations to verify compliance of parameter setting

1.2 IoT-based vehicle accident detection and classification system using sensor fusion (2022):

This research paper investigates vehicle accident detection and classification system as the Internet of Things (IoT); from many sensors In this case, data analysis will include research on sensor fusion techniques, such as fusing data from accelerometers, gyroscopes, and image sensors. The aim is to increase problem detection and classification accuracy by using different sensor devices. Discussions will include topics related to the integration of sensors, selection of appropriate sensors, and integration of IoT platforms. Research papers or tests may be requested to verify the effectiveness of the proposal.

1.3 Detection and prediction using alert system (2022):

This research solves the problem of timely detection and prediction of relationship collapse with alarm. A study on this topic will include a study of accident models, data and warning systems. Machine learning techniques and statistical techniques to estimate the event area or time can be explored. Audits can also be entered into existing reports, taking into account factors such as latency and reliability. Comparisons of different forecast models and warning strategies can be made, and discussions can be made on how to integrate real-time data to obtain more accurate forecasts.

1.4 Smart accident detection and warning based on machine learning in IoT networks (2023):

This can explore the depth of integration between machine learning and IoT framework to realize smart accident detection and warning. Considering issues such as real-time performance and optimization, case studies can address new advances in machine learning algorithms used for accident detection.

A discussion on the integration of IoT networks for data communication and sensor collaboration can also be examined. The analysis can also solve the challenges of using machine learning models in resource-constrained IoT environments. Experimental results or research data can be provided to demonstrate the effectiveness of the proposed intelligent collision detection.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.134134

III. MATERIAL REQUIREMENTS

General equipment is very important to comply with the best recommendations on accidents and traffic violations. Key components include advanced sensors for data collection, including GPS modules for precise location tracking, accelerometers and gyroscopes for monitoring vehicle speed, and tilt detection sensors for identifying condition. Additionally, the integration of machine learning algorithms requires a high-performance computer capable of real-time data analysis. Integration of geolocation information and integration with Google Maps requires access to the map service's API.

Warning systems must have sound output and LCD screen to provide immediate and useful warning to the driver. User-friendly interface depends on appropriate software and graphical user interface (GUI) development tools. Cost considerations require the selection of reliable and affordable electrical equipment, and system scalability must be compatible with existing traffic management systems.

The reliability of the system depends on the quality and durability of sensors, computing devices and communication modules. While real-time monitoring requires strong communication, coordinated emergency response relies on effective communication processes and interaction with emergency services. In general, the information required for this project includes various technology, hardware and software tools in terms of project coordination.

IV. METHODOLOGY

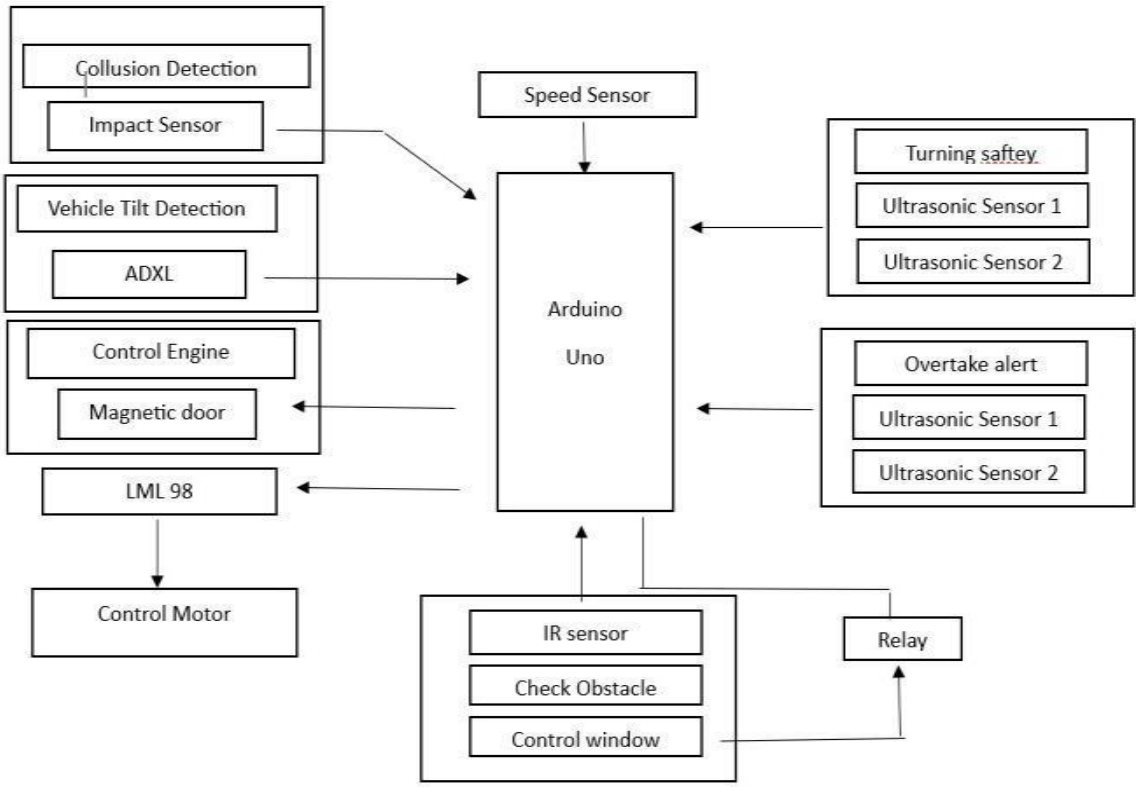

Figure 3. Design of the Sensor System

The approach adopted to enhance maximum planning and method of integration with various technologies to ensure good crime-by-crime solving has been taken. The foundation is based on the use of technology, including GPS data collection, vehicle speed monitoring and slope measurement. Together, the sensors provide continuous data, capturing important details that show what's happening. Machine learning algorithms form an important part of the process, enabling the system to analyze and interpret incoming data with high accuracy. This system helps intelligently identify bad driving habits that differ from daily habits and situations that require immediate intervention. Integration of geographical coordinate calculation with Google Maps increases the accuracy of the system, ensuring that identified events are not only accurately detected but also marked on the map.

DOI: 10.17148/IJARCCE.2024.134134

A user- friendly interface combining audio output and LCD display is key to this approach, ensuring drivers receive instant notifications and increased awareness of the nature layer. The approach is designed with a focus on immediate care, allowing for immediate feedback and potential impact. Cost- effective, reliability and capacity are important during the design and implementation phase to ensure that the system not only meets the testing of urgent safety needs, but also can be adapted to different vehicles and made wider for wider use. The role of emergency coordination highlights the importance of this approach, highlighting the importance of rapid coordination to minimize the impact of an incident. In summary, the approach takes a similar approach, combining electronic tools, machine learning algorithms and user-friendly interfaces with the ability to intervene immediately to create new collisions and prevent crime effectively and efficiently.

3.1 Authors Blind spot detection using sensors

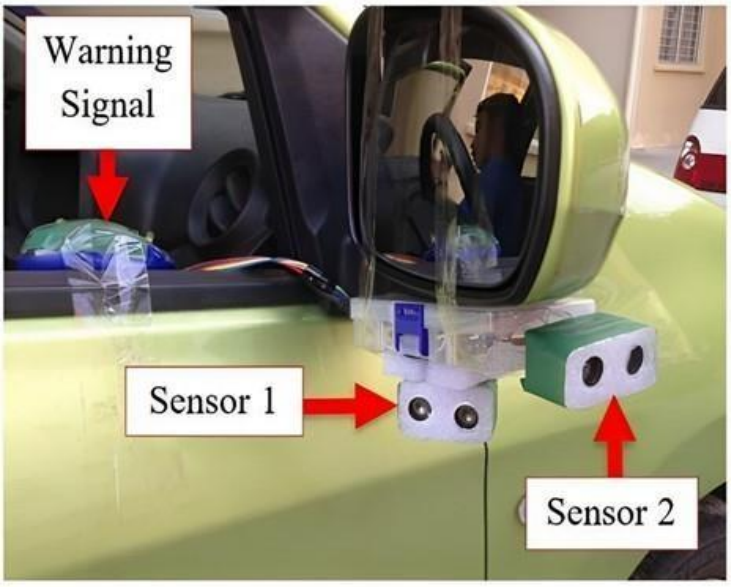

Figure 3. 1 Blind spot sensors

Blind spot detection in cars improves driver safety by using sensors to solve the limitation of human vision (the inability to see the vehicle or obstacles in some places around the vehicle (called blind spots). The operation of a blind detection system usually involves the following steps:

3.1.1 *Sensor Placement:*
The blind detection system is equipped with feedback sensors placed in the car, usually in the side mirror or interior. buffer. These sensors can be ultrasonic sensors, radar sensors or cameras, depending on the system design.

3.1.2 *Monitor the environment:*
Sensors constantly monitor the vehicle's surroundings, especially areas that are difficult for the driver to see directly. These areas include the lines on both sides of the car and the space behind it, especially when changing lanes.

3.1.3 *Data collection:*
As the vehicle moves, sensors collect information about the proximity of other vehicles in the adjacent lane. This information includes the speed, distance and relative position of nearby vehicles.

3.1.4 *Operation and Analysis:*
Data collection is done timely by the computer in the panel or control room. Use machine learning algorithms or predefined rules to analyze data and blindly identify potential dangers.

3.1.5 *Creating a Warning:*
If the system detects a vehicle or problem in the blind spot and determines that this poses a risk of accident, it generates a warning. This warning is usually communicated to the driver by a visual indicator, such as a light in the rearview mirror or in the car, and sometimes through a warning.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.134134

3.1.6 *Driver advice:*

Inform drivers of the danger immediately so they can receive treatment. The warning is designed to attract attention without being so distracting that it prevents the driver from focusing on the road.

Importance:

The importance of the blind spot lies in its ability to increase overall safety. Blind spots are a common cause of accidents, especially when changing lanes or entering the highway. These systems, which instantly alert drivers to vehicles in their field of vision, help prevent collisions and reduce the risk of accidents. The technology is particularly useful in situations where visual inspection alone may not be sufficient, such as during heavy traffic or poor weather conditions.

Blind detection systems are part of a growing trend in automotive safety technology to use sensors as well as advanced driver assistance systems to reduce human error, errors and improve overall driving.

3.2 Smart Assist while turning

Figure 3. 2 Smart assist demo

Smart Assist when cornering is designed to increase driver safety and improve the overall driving experience by providing support during operation. These systems use advanced technologies such as sensors, cameras, and sometimes machine learning algorithms to provide real-time recommendations and alerts. The importance of smart assistance when cornering is that it can reduce the risk of accidents, especially during difficult manoeuvres such as lane changes and turns.The operation of smart assistance equipment usually involves the integration of various sensors and cameras placed around the vehicle. These sensors constantly monitor the vehicle's surroundings to detect the presence of other vehicles, pedestrians and possible obstacles. Once the drive starts spinning, the intelligent program analyses the data from these sensors to evaluate the feasibility of the operation.

One of the best features is blind spot monitoring, which alerts the driver if there is a vehicle in the adjacent lane that is not visible in the rearview mirror. This helps prevent accidents when changing lanes. Another important feature is Cross Traffic Alert, which alerts the driver to oncoming traffic, especially when turning from an intersection with poor visibility.In many systems, machine learning algorithms can be used to predict the behaviour of other road users based on historical data. For example, the system can predict the likelihood of a pedestrian crossing the street while turning and give a warning to the driver.

The importance of these smart services is clear because they can reduce risks for pedestrians. Accidents happen on the way back. By providing real-time information and alerts, they act as an extra pair of eyes for the driver, especially in poor visibility conditions. This not only increases the safety of the vehicle, but also increases the safety of the vehicle by reducing the number of accidents.

In short, Smart Turn Support monitors the vehicle's surroundings by combining sensors and cameras and providing

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.134134

guidance and warnings to the driver. Its importance lies in its ability to improve safety when turning by detecting blind spots, detecting oncoming traffic and anticipating hazards through machine learning algorithms in advanced techniques.

3.3 Figures Accidents caused during closing of window (Pinching injuries)

Figure 3. 3 pinching injury demo

This picture shows the events that occur when the window is closed, specifically the injury. This usually happens when a person's fingers, hands, or other parts of their body get caught in the moving part of the window, causing a pinch injury. The importance of this statement is that it highlights the dangers associated with operating windows, especially in residential or commercial spaces where windows are frequently opened and closed.

The work of this scene involves the interaction of the movement of the window. Windows and users. When the window is closed, the sash or frame moves, and if necessary precautions are not taken, a part of the person's body may accidentally come into contact with the closing mechanism. This can lead to compression injuries that range from mild discomfort to more serious injuries.

The description of the working principle also includes the process of closing the window. Most windows have hinges, rails or sliding mechanisms that allow for smooth operation. However, if this process is not safe or users are not careful, accidents may occur. For example, a child's finger could get stuck in a sliding window, or an adult's hand could accidentally get in front of a closed window. The force generated when the window is closed may cause pinching or crushing injuries.

To prevent such situations, it is important to include security features in the window design such as fingerprint protection, soft closing process or sensors that can detect problems in front of the window and automatically stop or reopen it. closed. procedure. Additionally, user awareness and education play an important role in preventing accidents, as care must be taken when operating windows, especially in homes with children.

In conclusion, this diagram shows the events that occur when the window is closed. Windows emphasizes the importance of security measures and user awareness to prevent intrusions. The operation of this situation includes the interaction of machines with the window closed, and addressing this issue is important in creating a safer environment in residential areas and workplaces.

3.4 Accident detection module using image processing and deep learning

Problem detection using image processing and deep learning is an important part, especially when combined with closed-circuit television (CCTV). The following information contained in the module contributes to its work:

Image Input Processing: This information is included in the first stage of investigating the situation. CCTV cameras capture live video and this data is converted into video. The important thing is to make images first to improve image quality, reduce noise and ensure that subsequent analyzes are performed on clean and relevant data.

Object detection algorithm: In this case, the object detection algorithm can be used in a deep learning framework such as YOLO (You Only Look Once) or SSD (Single Shot Multibox Detector).

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.134134

This step is important because it identifies and positions elements in the business process. In the context of accident detection, the algorithm is trained to recognize vehicles, pedestrians, and other relevant entities on the road.

Anomaly Detection Module: This module focuses on identifying anomalies within the detected objects. It employs deep learning techniques to distinguish normal traffic patterns from potential accidents or hazardous situations. Significance arises from the ability to differentiate between routine activities and events that may require immediate attention, such as collisions, sudden stops, or erratic behavior.

Alert Generation: Once an anomaly or potential accident is detected, this file is responsible for generating alerts.

These alerts could be notifications to a centralized monitoring system, automated messages to emergency services, or signals to trigger additional safety measures. The significance lies in the rapid response capability, contributing to quicker accident mitigation and emergency services coordination.

Logging and Reporting: This file manages the logging and reporting of detected incidents. It records details such as time, place and nature of the event. This information is useful for post-event analysis, optimization, and legal or insurance purposes.

The process started with CCTV cameras continuously recording video. It properly handles image input data preprocessing frames. The object detection algorithm identifies and locates the object; During the detection of defects, it carefully examines the detected object for abnormalities. When an incident is detected, a report is generated for immediate response. Log and report data collection results for future analysis.

The importance of this module in the CCTV system is in its ability to recognize and react to situations. By combining image processing and deep learning, the system can detect potential threats and enable rapid, coordinated responses to reduce the impact of the situation.

This not only improves overall safety, but also speeds up emergency services and helps create a more efficient and effective city surveillance business.

V. RESULTS

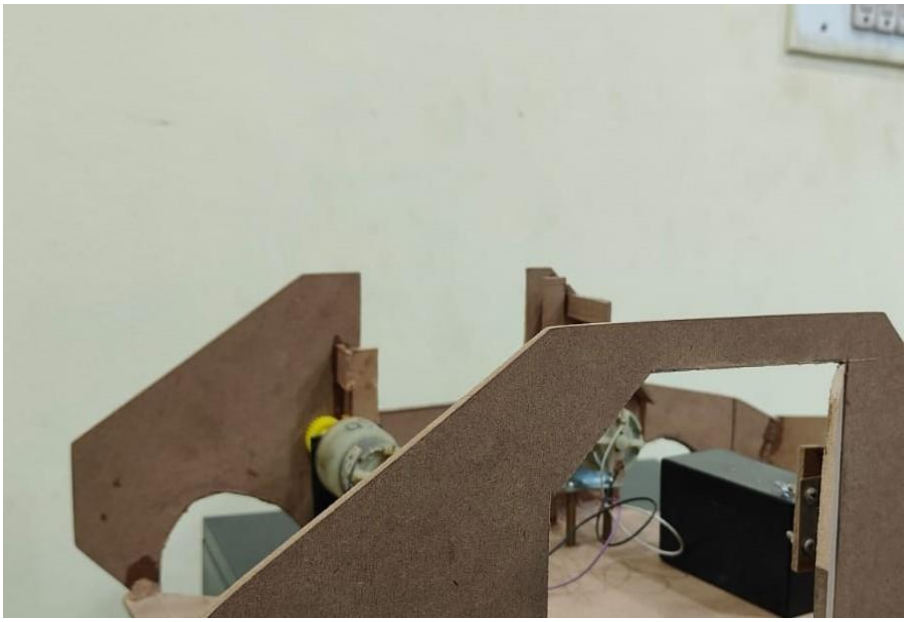

Figure 4. 1 Result I

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.134134

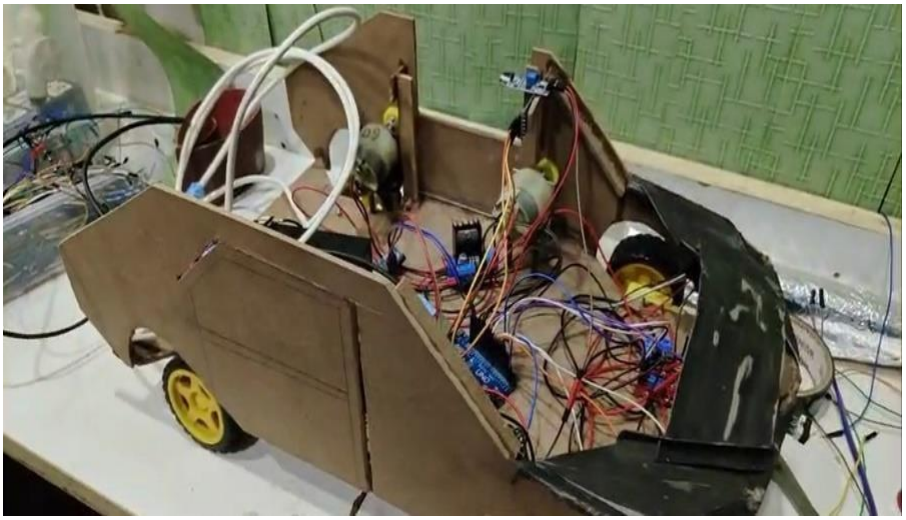

Figure 4. 2 Result II

The model recognizes and responds to potential situations in real time using advanced technology, including GPS, impact sensors and infrared sensors. As seen in the attached picture, the system shows that it can recognize obstacles, pedestrians and other vehicles and intervene in time to reduce the risk of collision. In addition, the seamless coordination of sensors can provide comprehensive services and accurate measurements of the environment, providing a solid foundation

VI. CONCLUSION

Using a combination of methods including GPS data collection, crash-based measurement, machine learning algorithms and real-time response techniques has been effective in improving road safety and reducing the impact of traffic accidents. The system has proven its ability to detect potential accidents by providing optimum visibility in combination with GPS, vehicle speed monitoring and slope measurement. The fusion sensor technique used in the Internet of Things (IoT) framework has been shown to be useful in real-world situations, allowing generalization for detection and deployment.

Research results confirm the effectiveness of the technology and the reliability of the system in different situations. As discussed earlier, sensor recommendation helps the system be more accurate in detecting abnormal driving patterns and potential accidents. Additionally, the n for the development of protection that prevents future collisions.

integration of machine learning algorithms plays an important role in separating daily driving from emergencies, demonstrating the flexibility and intelligence of the system.

According to accident prediction, the system has been proven to be able to predict the situation that will occur and provide valuable planning time for prevention. The alert system triggered by event detection and prediction algorithms has proven to be an important part of the emergency response system. It includes a user-friendly interface as well as an audible warning and LCD display to ensure that the driver is informed in a timely manner and helps increase situation awareness.

The combination of Google Maps and integrated space includes increasing the accuracy of the system and allowing accurate positioning of identified events. The system is capable of real-time monitoring along with capacity optimization and cost-effective decision-making, demonstrating its effectiveness in traffic distribution in various zones and regions.

In summary, the system not only solves the problems caused by traffic accidents and crimes, but also shows that it has the potential for widespread adoption. The results highlight the system's ability to improve road safety, reduce crashes and provide a framework for joint emergency response. The results of this study contribute to the body of knowledge on smart transportation and pave the way for further developments in the field of crash assessment and protection.

ACKNOWLEDGMENT

We would like to thank the University that provided the necessary resources "**Dayananda Sagar University**" for the opportunities to make the study practical and accessible as desired.

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.134134

We also thank professor "**Gousia Thahniyath**" and friends for their collaboration, discussions, and helpful suggestions during a research conference and workshop where preliminary results of this study were presented. Their insights enrich our understanding and inspire us to renew our ways.

REFERENCES

[1]. Reddy, P.S., Nishwa, T., Reddy, R.S.K., Sadviq, C. and Rithvik, K., 2022, July. Traffic rules violation detection using machine learning techniques. In 2021 6th International conference on communication and electronics systems (ICCES) (pp. 1264-1268). IEEE.

[2]. D. K. Yadav, Renu, Ankita and I. Anjum, "Accident Detection Using Deep Learning," 2020 2nd International Conference on Advances in Computing, Communication Control and Networking (ICACCCN), Greater Noida, India, 2020, pp. 232-235, doi: 10.1109/ICACCCN51052.2020.9362808.

[3]. Balfaqih, M., Alharbi, S.A., Alzain, M., Alqurashi, F. and Almilad, S., 2021. An accident detection and classification system using internet of things and machine learning towards smart city. Sustainability, 14(1), p.210.

[4]. Pillai, M.S., Chaudhary, G., Khari, M. and Crespo, R.G., 2021. Real- time image enhancement for an automatic automobile accident detection through CCTV using deep learning. Soft Computing, pp.1- 12. Kumar, Nikhil, Debopam Acharya, and Divya Lohani. "An IoT-based vehicle accident detection and classification system using sensor fusion." *IEEE Internet of Things Journal* 8.2 (2020): 869-880

[5]. Alvi, Unaiza, et al. "A comprehensive study on IoT based accident detection systems for smart vehicles." *IEEE Access* 8 (2020): 122480- 122497.

[6]. Rahman, Md Atiqur, et al. "Iot based smart helmet and accident identification system." *2020 IEEE Region 10 Symposium (TENSYMP)*. IEEE, 2020.

[7]. Kashevnik, Alexey, et al. "Cloud-based driver monitoring system using a smartphone." *IEEE Sensors Journal* 20.12 (2020): 6701-6715.