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Real-Time Accident Detection and Notification System

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ABSTRACT: Since traffic accidents are a major risk to public safety, efficient emergency response systems are required. The purpose of this study is to improve emergency responses and traffic management by presenting a real-time accident detection and notification system with ambulance detection. For the purpose of detecting accidents and ambulances, a variety of datasets were gathered and categorized. Convolutional neural networks (CNNs) are integrated with OpenCV to allow real-time video stream analysis for the purpose of identifying ambulance vehicles and detecting accidents. Our solution makes use of the Twilio API to deliver SMS notifications with real-time accident locations, allowing emergency personnel to respond quickly. Afterwards, visual signals are given to pedestrians and cars to let them know when ambulances are approaching, resulting in improved traffic flow and quicker emergency responses. This strategy puts simplicity and effectiveness in accident detection first, with the ultimate goal of improving road.

KEYWORDS: OpenCV, Twilio, Convolution Neutral Network (CNNs), Python, Camera, Geolocation.

I. INTRODUCTION

Due the more road accident takes place in various cities. Nowadays the cause of death increasing more by accident. If an accident met in a national highway roads no one there to rescue the person to met with an accident this is due to lack of emergency facilities and rescue team to overcome these drawback our paper proposed this method can automatic indicating device for vehicle accident is used in this paper it is used protect the people from the risk as soon as possible after occurrence the accident wasting a time may leads to death. so this system will detect the accident within the less time and convey the information to the police station and to rescue system after a few seconds. this project proposes the development of an advanced Real-time Accident Detection and Notification System with Ambulance Detection. By harnessing cutting-edge technologies such as computer vision, Internet of Things (IoT), and real-time communication, the system aims to revolutionize the way accidents are detected, assessed, and responded to.

Nowadays, there is an increase in the number of accidents that happen in the world. As the population grows, so do the number of cars on the roads, leading to daily serious severe accidents. Around 80% of accidents contribute to the loss of many lives. Mostly, the growing countries are being targeted by day-to-day road accidents. The major reason is the lack of infrastructure, lack of traffic control and accident management. Out of all the developing countries, India has been listed as the country with a higher number of accidents. The main reason for the loss of a life during an accident is the unavailability of immediate help that can save a person's life in a few seconds. The moment an accident occurs, the life of all passengers travelling in the vehicle is at stake. It all depends on the response time that can save their lives by a few minutes or seconds. According to the statistics, reducing accident delay time by even 1 minute can save 6 per cent of lives. Hence, this response time is very crucial, and it needs to be reduced or at least improved to save their lives. To contribute to our society and reduce the number of accidents happening in our day-to-day life, there are several techniques and mechanisms that can drop down the rate of accidents and can save lots of lives. Living in a tech world that is growing day by day with new technologies, we can apply these techniques in our society and help them overcome such problems.

The suggested technology is unique in that it can identify and react to accidents as well as ambulance vehicles. The system can detect ambulances in real-time video feeds and warn passing cars and pedestrians visually by repeating the data collecting, labeling, and training procedures. This reduces injuries and maximizes road safety by facilitating better traffic flow and speeding up emergency response times.

In essence, this project aims to leverage modern technologies to create a robust and efficient system for accident detection, notification, and response. Through seamless integration with existing infrastructure and real-time communication channels like Twilio, the system seeks to revolutionize emergency management on our roads, paving

the way for safer and smarter transportation networks.



II. RELATED WORK

- 1. "Wireless black box using MEMS accelerometer and GPS tracking for accidental monitoring of vehicle"**

This paper discusses an AI-enabled system designed for smart cities to detect and alert about accidents using IoT (Internet of Things) devices and deep learning techniques. The system likely involves sensors placed in various locations to monitor traffic and detect accidents, with AI algorithms analysing the data collected to identify potential incidents. When an accident is detected, the system sends alerts to relevant authorities or emergency services to respond promptly. The integration of IoT and deep learning enables real-time monitoring and efficient accident management in urban areas.
- 2. "Motorcycle Detection and Tracking System with Occlusion Segmentation"**

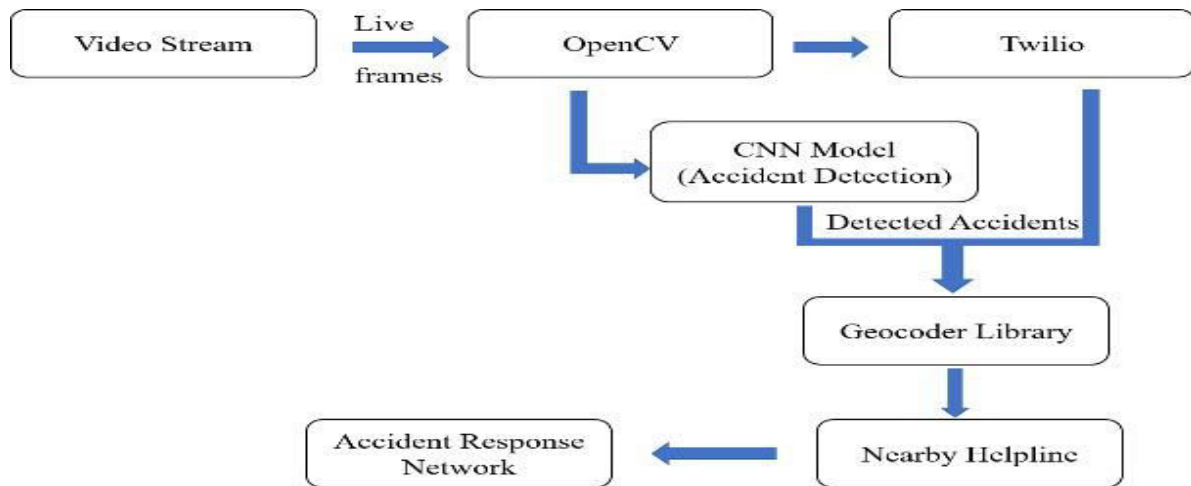
This paper presents a system that utilizes IoT technology for detecting and classifying vehicle accidents through sensor fusion. Sensor fusion involves combining data from multiple sensors to improve accuracy and reliability. In this context, the system likely incorporates various types of sensors such as accelerometers, gyroscopes, and GPS devices installed in vehicles to collect data related to motion, orientation, and location. By fusing data from these sensors, the system can accurately detect accidents and classify them based on severity or type. This technology could potentially enhance road safety by enabling rapid response to accidents and providing valuable insights for accident analysis and prevention.
- 3. "A Review of Time-Based Solar Photovoltaic Tracking Systems"**

An accident detection and alert system, like the one mentioned by Kalyani T, Monika S, and Naresh B, typically involves the use of sensors and communication technology to detect accidents and promptly notify relevant authorities or emergency services. These systems often employ various types of sensors such as accelerometers, gyroscopes, and GPS devices to monitor factors like vehicle speed, sudden changes in motion, or impact forces indicative of an accident. When an accident is detected, the system sends alerts to predefined contacts, such as emergency responders or designated contacts of the vehicle occupants, to facilitate rapid assistance and intervention. Such systems can play a crucial role in reducing response times to accidents and improving overall road safety.

4. “Hybrid Deep Learning Signature based Correlation Filter for Vehicle Tracking in Presence of Clutters”

It involves the use of technology to detect the presence and approach of ambulances on the road. This system could utilize various sensors, such as cameras, radar, or acoustic sensors, to identify the unique characteristics of ambulances, such as flashing lights, sirens, or distinctive markings. By detecting these signals, the system can accurately identify ambulances and track their movements in real-time. This information can be used to improve traffic management by giving priority to ambulances, enabling them to navigate congested areas more efficiently and ensuring timely arrival at their destinations, ultimately enhancing emergency response capabilities and potentially saving lives.

III. SYSTEM DESIGN



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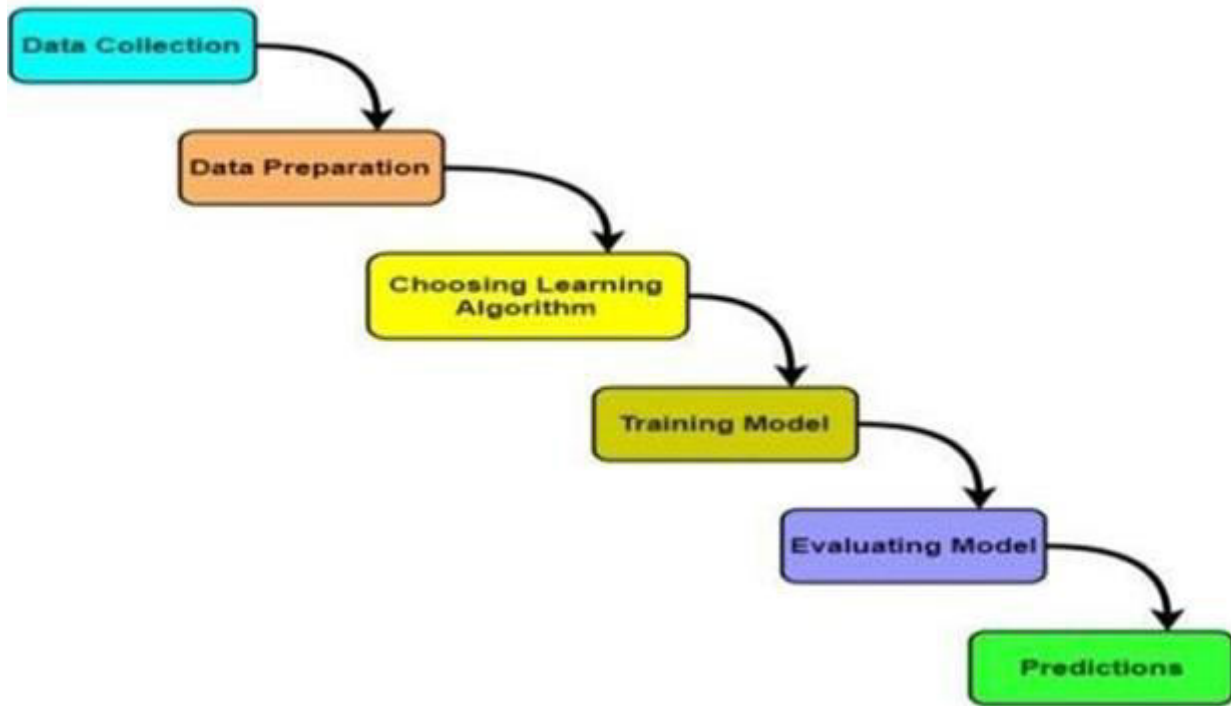
Project Review

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- **Live video Stream:** This block depicts the constant stream of video data that was obtained from a camera source, most likely one that was installed on a public road or traffic monitoring system.
- **OpenCV:** This block talks about the OpenCV library. OpenCV is one of the most popular open source software frameworks for real time computer vision. It offers tools and algorithms to process and analyse images, which are essential for capturing frames from live video streams.
- **Frames:** OpenCV extracts frames from live video streams. A frame is a snapshot of a video at a particular time.
- **CNN Model (Accident Detection):** Convolutional Neural Network (CNN) could be a sort of profound learning demonstrate particularly outlined for picture investigation. In this framework, the CNN model is prepared to recognize highlights within the extricated video outlines that are demonstrative of an mishap, such as sudden movement obscure, unordinary vehicle situating, or changes in street structure.
- **Detected Accidents:** The CNN model outputs a signal indicating whether an accident has been detected in the analysed frame.
- **Geocoder Library:** The CNN show yields a flag demonstrating whether an mishap has been recognized within the analyzed frame. This piece alludes to a program library that changes over geographic arranges (scope and longitude) into a human-readable address.
- **Accident Response Network:** This block signifies the communication network that transmits accident data (likely including the location and time of the incident) to emergency response services.
- **Nearby Helpline:** This piece speaks to the crisis administrations that will be informed upon mishap location. This may incorporate rescue vehicle administrations, fire offices, or law authorization offices.

IV. METHODOLOGY

Accident Detection Algorithms: Develop or implement algorithms for real-time accident detection. These could include Computer vision algorithms for analyzing traffic camera feeds. Machine learning models trained on historical accident data to predict and detect accidents. Natural language processing techniques for analyzing social media reports.



Data Collection and Integration: Collect various data sources that can help in accident detection, such as Traffic camera feeds, GPS data from vehicles Roadway sensors (e.g., for detecting sudden changes in speed or direction), Social media reports.

Dataset Labeling : Label each image in your dataset as either an accident or a non-accident. This labeling step is crucial for supervised learning, where the algorithm learns from labeled examples.

Monitoring and Maintenance: Screen the execution of your sent framework and address any issues or irregularities that emerge. Occasionally upgrade your models and calculations with modern information and changes to preserve their viability over time. Continuously accumulate criticism from clients and partners to refine and upgrade the system's usefulness and ease of use.

Evaluation and Optimization: Evaluate your trained model using metrics such as accuracy, precision, recall, and F1-score on the testing set. Optimize the model by fine-tuning hyperparameters, adjusting the architecture, or incorporating techniques like dropout or batch normalization to improve performance.

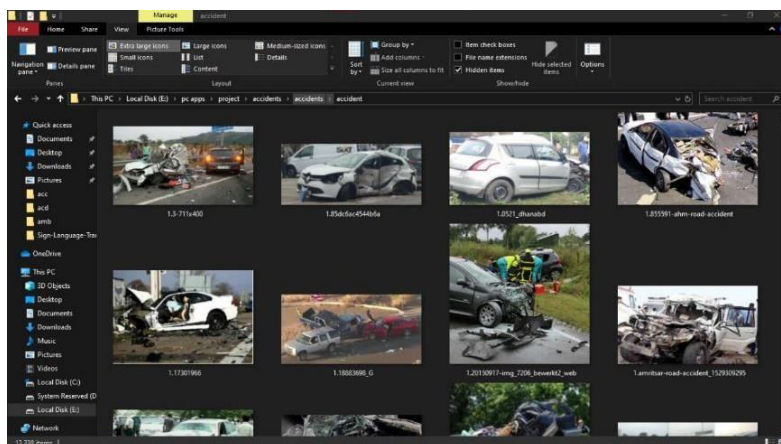


FIG.1 ACCIDENT DATASETS

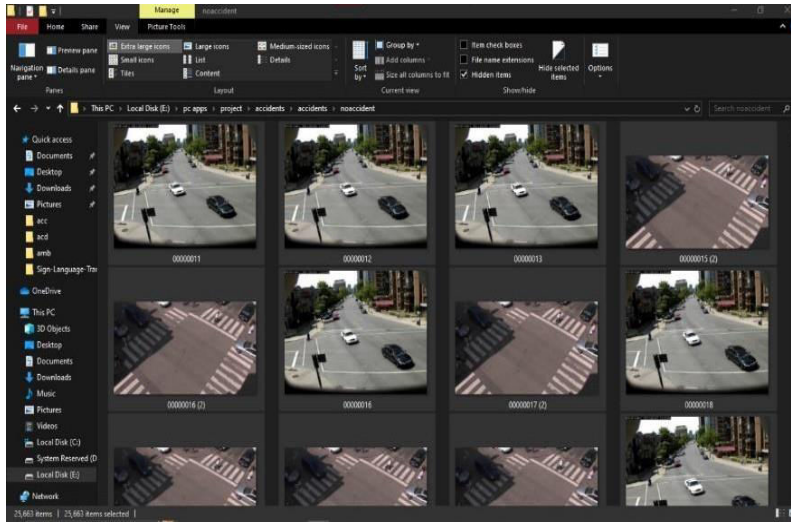


FIG.2 NON-ACCIDENT DATASETS

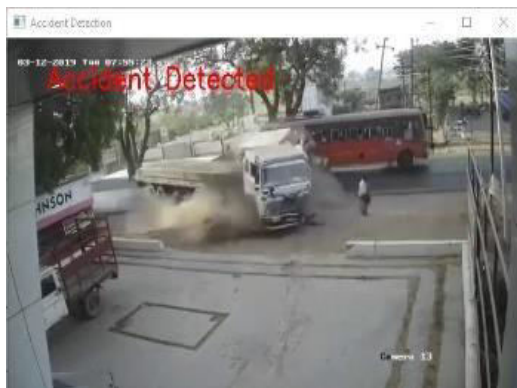


FIG.3 : ACCIDENT DETECTION

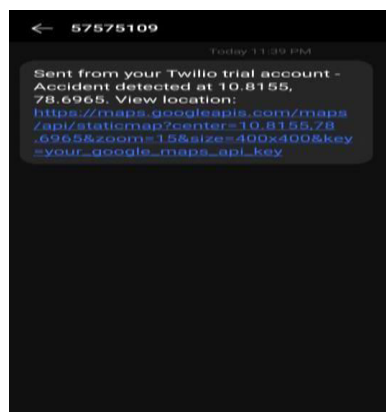


FIG.4 : Twilio Notification

V. CONCLUSION

To sum up, the creation of an accident detection and warning system is a noteworthy development in the field of road safety technology. The system provides an emergency response and accident management strategy that is proactive by utilizing real-time communication and computer vision. Accidents can be quickly and correctly recognized by integrating cameras, sensors, and machine learning algorithms. This allows emergency services and nearby responders to be notified in a timely manner. The employment of geolocation services additionally guarantees accurate accident location data, hence augmenting the effectiveness of emergency response endeavours. All things considered, putting this system into place might save lives, lessen injuries, and diminish traffic jams, which would be a major step towards building safer and more intelligent transportation networks for cities all over the world. Research and development in this field should continue.

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