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REAL TIME VEHICLE COLLISON DETECTION USING BOUNDING BOX WITH ALERT SYSTEM

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***Abstract*—**This research presents an innovative application of deep learning techniques for the early detection and classification of plant diseases, highlighting the exceptional performance of the ResNet9 model. The study begins with a meticulous implementation of ResNet9 on the diverse and extensive PlantVillage dataset, achieving an impressive 99.2% accuracy. This success is attributed to strategic parameter tuning, incorporating techniques such as learning rate scheduling, gradient clipping, and weight decay. The investigation is expanded to address unique challenges in Indian agriculture, with the curation of datasets for major crops such as cotton, rice, and groundnut. The commitment to practical application is manifested in the development of a userfriendly web interface, strategically designed to empower farmers. This interface, based on Convolutional Neural Networks (CNNs), facilitates accurate disease identification across different crops, offering a comprehensive solution for precision agriculture. Through this tool, farmers gain valuable insights into disease prevention methods, enhancing their decisionmaking in sustainable crop health management. The findings underscore the efficacy and versatility of the approach, positioning it at the forefront of leveraging technology for the advancement of global food security and agricultural sustainability.

Keywords— Road accidents, Accident detection, Alert system, Control room, Convolutional neural network, deep learning

I. INTRODUCTION:

India, more than 150,000 people die due to traffic accidents that means, about 400 fatalities a day! Surveys have been conducted and found that the source of majority deaths across the world is due to road accidents. Approximately 50 – 60 percent of the delays on urban freeways are associated with incidents, and on urban surface streets, a large percentage of traffic accidents and most delays occur at or near intersections [1]. In India 377 people die every day due to road accident which is four times more than the annual death toll from terrorism [2]. World Health Organization conducted a survey on different causes of death due to injury [3]. 93 percent of the world's fatalities on the roads occur in low- and middle-income countries, even though these countries have approximately 60 percent of the world's vehicles [4]. Most of the deaths arise due to the lack of immediate medical care provided to the victim at the time of an accident. Traffic hazard is one of the major issues to be dealt with, when it comes to transportation. Studies have shown that approximately four deaths are happening in every minute due to road accidents. Deaths occur mostly during the first hour of impact. Delay in reporting the accidents immediately to the control room is a serious issue. A lot of delay arises in each and every stage due to the human element involved [5]. Our government had implemented many strict rules to reduce the accidents that are increasing day by day. But unfortunately, they are not proven to be sufficient to reduce the number of accidents. Thus, only possible solution is to reduce the number of deaths caused due to these accidents.

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Evaluation of the systems using these components reveals that the system lacks accuracy and the proposed model can identify accidents more accurately and effectively than these existing ones. The system provides mechanism that sent an alert to the control room to ensure timely action to help the victim of accident. For the working of the system, deep learning technique was used that uses convolutional neural network. There were no dataset available for training the system. So, a dataset was created that focuses on accidents occurring in India. The images were then trained on the convolutional neural network (CNN) model. The trained model was tested with external images and obtained an accuracy of eight-five percent. Video classification is done by performing the technique of averaging of frames. It isused for detecting accidents in real time

II. LITERATURE SURVEY:

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III. EXISTING SYSTEM:

Real-time vehicle collision detection using a bounding box methodology with an alert system is a critical application of computer vision and artificial intelligence in enhancing road safety. By leveraging bounding box techniques, this system can accurately detect and track vehicles within a video feed, enabling the identification of potential collision risks based on proximity, speed, and trajectory analysis. Through the implementation of machine learning algorithms for object detection and tracking, this system can provide real-time alerts to drivers, traffic management systems, and emergency responders when a collision risk is detected. By integrating sensors and cameras on vehicles and infrastructure, this system can continuously monitor the surrounding environment and analyze data to predict and prevent potential collisions. The alert system can notify drivers to take

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evasive actions, warn nearby vehicles, and notify authorities for swift response and assistance. This proactive approach to collision detection not only enhances road safety but also reduces the severity of accidents and saves lives by enabling timely intervention. By applying advanced technologies such as machine learning and real-time data processing, this system transforms traditional collision prevention methods and contributes to creating a safer and more efficient transportation ecosystem.Realtime vehicle collision detection using the bounding box methodology implemented with an alert system represents a cutting-edge approach to enhancing road safety. This system leverages advanced machine learning techniques to constantly monitor and analyze traffic patterns, identifying potential collisions through real-time analysis of vehicle movements and spatial data. By utilizing bounding boxes to detect the proximity of vehicles and predict potential collision scenarios, this innovative technology can provide immediate alerts to drivers, traffic management centers

IV. PROPOSED SYSTEM:

Since there was no dataset available, a dataset was created that includes accident and non-accident images. If an accident occurs, an alert message will be sent to the nearby control unit. We trained the system with the created dataset. The trained system is then incorporated with the cameras so as to capture the video of the vehicles on the road. By calculating the probability, the system predicts whether an accident happened or not. In case of an accident, an alert is sent to the control rooms using the GSM module. Fig. 1 is the flowchart depicting working of the system. The camera module records the video of vehicles in the road. The camera is placed at fixed locations, mostly in accident-prone areas. Whenever an accident occurs, it is predicted using our deep learning model and followed by sending alert message to the nearby control rooms.

SYSTEM STUDY:

FEASIBILITY STUDY:

A feasibility study for a real-time vehicle collision detection system utilizing a bounding box methodology with an alert system is crucial to assess the viability and practicality of implementing such technology. The study will encompass various dimensions including technical feasibility, economic feasibility, operational feasibility, and legal feasibility. From a technical standpoint, it will evaluate the availability of requisite technology, data sources, and expertise necessary for developing and maintaining the system. Economic feasibility will involve cost estimation, ROI analysis, and potential funding sources for the project. Operational feasibility will assess the impact on existing processes, workflow, and staff training requirements upon system implementation. Legal feasibility will focus on ensuring compliance with data protection laws, ethical considerations, and regulatory requirements related to handling sensitive information. Furthermore, stakeholder analysis, risk assessment, and market research will play integral roles in the feasibility study to ascertain that the proposed collision detection system is not only technically feasible but also beneficial and sustainable in enhancing road safety. The study will offer valuable insights and recommendations to support decision-making regarding the progression with the development and deployment of the system, taking into account all critical factors involved.

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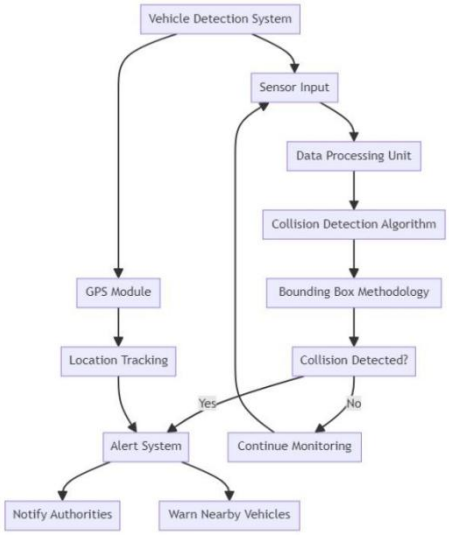

Fig 1: System Architecture

ECONOMICAL FEASIBILITY:

Real-time vehicle collision detection using a bounding box methodology with an alert system is a promising application of machine learning technology that can significantly enhance road safety. When considering the economic feasibility ofimplementing such a system, several key factors need to be taken into account. First and foremost, the initial development costs of creating the machine learning models for collision detection and the software infrastructure for real-time monitoring should be considered. This includes expenses related to hiring data scientists, machine learning experts, software developers, and hardware acquisition to support the system's operations. 9 Ongoing costs for maintaining and updating the system are also crucial. This involves regular monitoring of the system's performance, data accuracy, and alerting functionality. Continuous improvements and adjustments based on real-world feedback are necessary to ensure the system remains effective and reliable. On the benefits side, the economic impact of implementing a real-time collision detection system can be substantial. By identifying potential collisions in advance and alerting drivers or emergency services promptly, the system can help prevent accidents and reduce the associated costs of property damage, injuries, medical expenses, and legal fees. Furthermore, the system can lead to improved traffic flow and reduced congestion by facilitating quicker response times to accidents, thereby enhancing overall road efficiency and potentially reducing fuel consumption and greenhouse gas emissions. In conclusion, assessing the economic feasibility of a real-time vehicle collision detection system using machine learning techniques is essential to ensure that the investment in such technology is justified by the tangible benefits it can bring in terms of enhancing road safety, reducing accident related costs, and improving overall traffic management.

SOCIAL FEASIBILITY:

Real-time vehicle collision detection using bounding box methodology with an alert system is a promising application of machine learning techniques that can significantly enhance road safety. However, it is crucial to consider social feasibility aspects when implementing such a system to ensure its acceptance and support from various stakeholders.
12 Ethical considerations play a key role in deploying a vehicle collision detection system, as it directly impacts the safety and privacy of individuals on the road. Respecting the rights and privacy

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of drivers and passengers while prioritizing their well-being is paramount. Transparency in how the system operates, the data it collects, and how alerts are triggered is essential to build public trust. Accessibility and usability are vital components of social feasibility for a vehicle collision detection system. Ensuring that the system is user-friendly for both drivers and emergency responders will be key to its successful implementation. Providing adequate training and support to all stakeholders involved, including law enforcement, emergency services, and other relevant authorities, will be crucial for effective utilization. Engaging with the community to gather feedback and input on the design and implementation of the collision detection system is essential for social acceptance. Building partnerships with local organizations, community leaders, and road safety advocates will help tailor the system to meet the specific needs and concerns of different groups. In conclusion, social feasibility plays a critical role in the successful implementation of a real-time vehicle collision detection system. By addressing ethical implications, ensuring transparency, promoting accessibility, and engaging with stakeholders, the system can effectively contribute to enhancing road safety while upholding social values and principles

DATA FLOW DIAGRAM:

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.

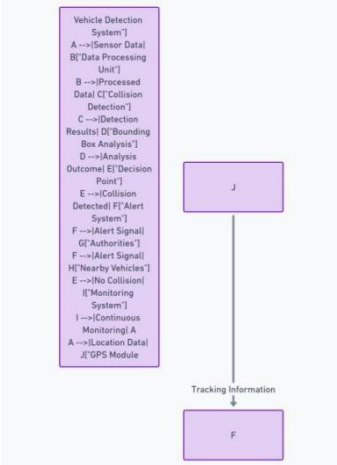

Fig 2: Data Flow Diagram

UML DIAGRAMS UML:

stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group. GOALS: 1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models. 2. Provide extendibility and specialization mechanisms to extend the core concepts. 3. Be independent of particular programming languages and development process.
4. Provide a formal basis for understanding the modeling language. 5. Encourage the growth of OO tools mar

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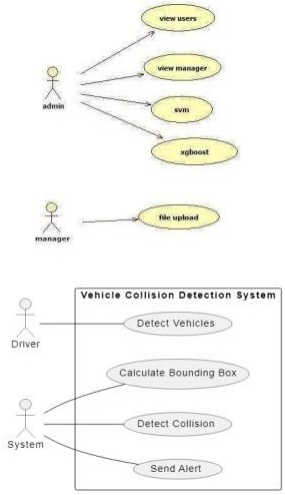

Fig 3: Use Case Diagram

V. IMPLEMENTATION

DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output

MODULES:

- Vehicle Detection Module
- Accident Detection Module
- Alert System Module

MODULES DESCRIPTION:

5.1 VEHICLE DETECTION MODULE

Description: This module is responsible for detecting vehicles in real-time using computer vision techniques. It employs image processing algorithms to identify and localize vehicles within a video stream or image frames.
Functionality: Utilizes techniques such as Haar cascades, deep learning-based object detection models (e.g., YOLO, SSD), or feature extraction methods (e.g., HOG) to detect vehicles.
Input: Video feed or image frames captured by cameras installed on the road.
Output: Detected vehicle locations represented as bounding boxes.

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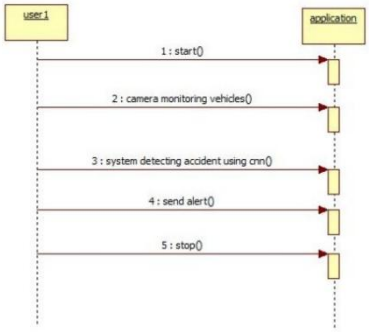

Fig 4: Sequence Diagram

5.2 ACCIDENT DETECTION MODULE

Description: This module analyzes the detected vehicle data to identify accidents in real-time.
Functionality: Utilizes deep learning techniques and algorithms to detect unusual patterns or sudden changes in vehicle movement that indicate an accident. The system

continuously monitors the video feed for collisions or abruptstops.
Input: Detected vehicle locations from the Vehicle DetectionModule.
Output: Bounding boxes around the vehicles involved in the accident and an accident detection signal.

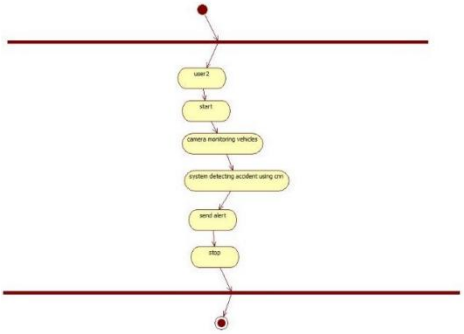

Fig 5: Activity Diagram

5.3 ALERT SYSTEM MODULE

Description: This module is responsible for generating and disseminating alerts to the nearest control room when an accident is detected.
Functionality: Utilizes communication protocols such as Wi-Fi, Bluetooth, or cellular networks to transmit alerts in real- time. The alert includes information such as the location

of the accident and the bounding boxes around the involved vehicles.
Input: Accident detection signal and bounding boxes from the Accident Detection Module.
Output: Alert messages sent to the nearest control room, including visual data with bounding boxes and location details

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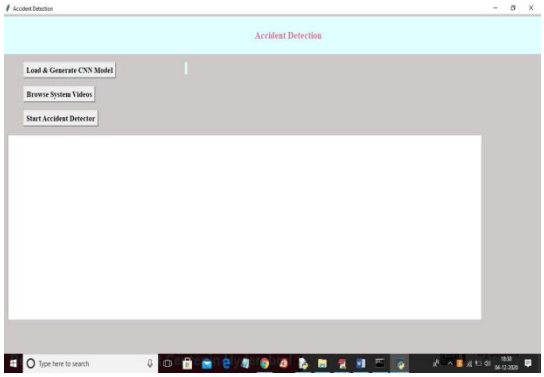
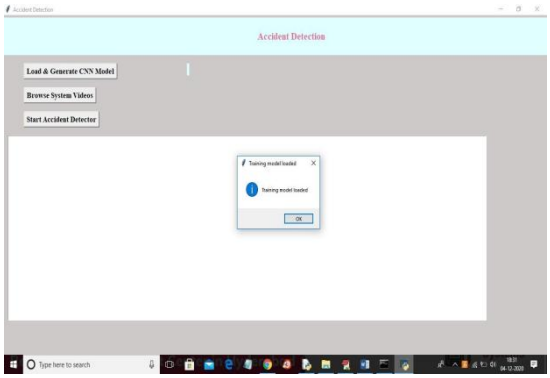
VI. RESULTS AND ANALYSIS

ACCIDENT DETECTION:

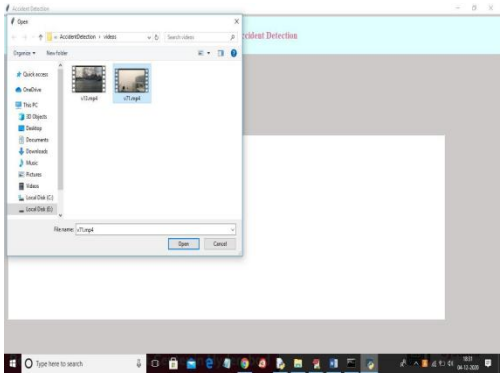
This project is trained with images where vehicles collided and accident occurred and in test video if anything such collision happens between vehicles then application detect as accident. Training is done with tensorflow and CNN Algorithm. To run project double click on run.bat file to get below screen



In above screen click on 'Load & Generate CNN Model' button to trained CNN with dataset and to load CNN model using tensorflow



In above screen tensorflow model is loaded and now click on 'Browse System Video' button to upload video



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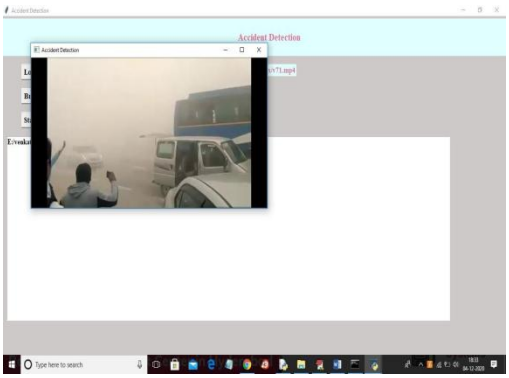
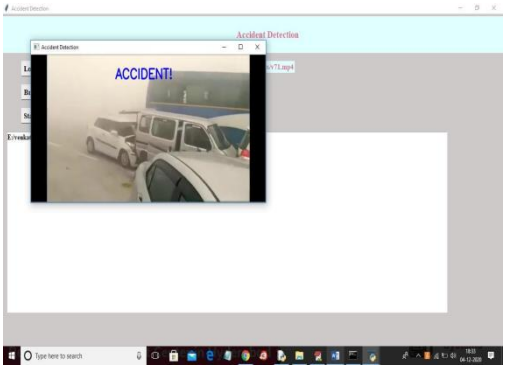
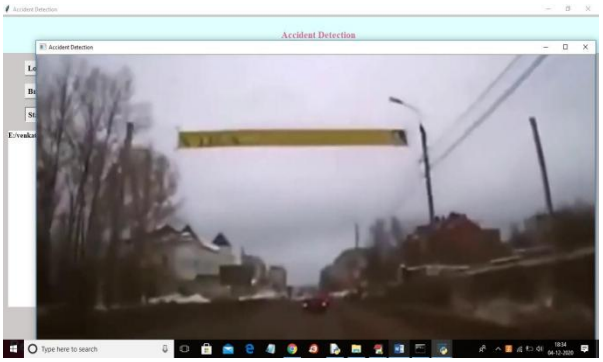
In above screen selecting and uploading video and then click on ‘Open’ button to load video

In above screen video is loaded and now click on ‘Start Accident Detector’ button to play video and detect accident



In above screen video start playing and upon accident detection will get below screen with beep sound





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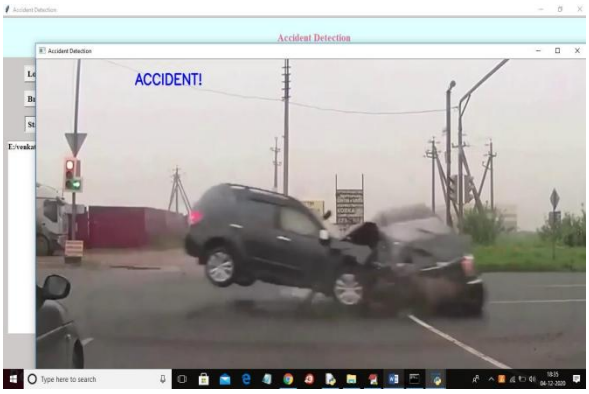
In below screen playing another video without messageif normal driving appear



In above screen upon collision then accident display messagewill appear with beep sound In below screen application is trained with below images

VII. CONCLUSION:

The proposed system is used to detect road accidents. When an accident is detected, an alert message is sent to nearby control rooms using the GSM module. This system is more reliable and economical when compared to existing systems. It can detect accidents with high level of accuracy as the model architecture is trained using the created dataset. Our preliminary evaluation shows that the system works in aperfect manner and can be deployed over a large area. With the help of this system, immediate action can be taken by sending alert to the officials and will help the medical teams to reach the accident spot in time and save the valuable human lives. Thus, the proposed system will play an important role in the society where road accidents have nowadays become a major threat.

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