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Real Time Accident Detection System using CNN

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***Abstract* - In India, accidents are a major cause of death. Over 80% of accident fatalities are caused by delayed assistance to victims. Accident victims can be left unattended for extended periods on lightly trafficked highways. To address this issue, we propose a system that uses deep learning to detect accidents from live CCTV video feeds. Each video frame is processed by a Convolutional Neural Network (CNN) trained to distinguish between accident and non-accident scenarios. CNNs are known for their speed, accuracy, and reduced preprocessing requirements, making them suitable for this task. With smaller datasets, CNN-based image classifiers have achieved over 95% accuracy.**

Keywords: Real Time, Accident Detection System, CNN, Convolutional Neural Network.

I. INTRODUCTION

The primary objective is to implement a system capable of recognizing accidents from video footage captured by cameras. By promptly detecting accidents and alerting authorities, the system aims to provide timely assistance to accident victims.

We propose utilizing advanced Deep Learning Algorithms, specifically Convolutional Neural Networks (CNNs), to analyze video frames and identify accidents within seconds of occurrence [1].To prioritize areas with greater need, we focus on highways with lighter traffic where accident victims may face significant delays in receiving assistance. We suggest installing CCTV cameras at intervals of approximately 500 meters along these highways. These cameras would serve as surveillance points, and the proposed accident detection system would process the footage to identify accidents [2].

II. LITERATURE SURVEY

[1] Robinin M.S,Sukanya Mulakalapally, Maha Lakshmi " Car Accident Detection and Notification System Smartphone". Portability Using can provide accident detection and notification on phones using filters to prevent false positives. It is compatible with all types of vehicles, including bicycles and motor bikes. It may not be possible to detect all accidents with smartphones due to the filters used to prevent false alarms: there may be instances of minor collisions that the application does not register[11].

[2] Heting Liu and Guohong Cao, Fellow, "IEEE Deep Learning Video Analytics Through Online Learning Based Edge- Computing" Predictng trajectories of traffic per clipart in traffic as well as their future local on. Use of a Convolutional LSTM Auto- Encoder. This method is unable to detect an accident if participants gets totally suspended.

[3] Ghosh, s., sunny, soju. And Roney "efficient vehicle accident detection system using CNN" It uses advanced Deep Learning Algorithms CNN in order to analyze the frames taken from the video provided. Deep cans usually suffer vanishing gradients.

[4] Tianxiang Tan and Gushing Cao "Deep Learning Video Analysis Through Edge Processing and NPU in Mobile" Use of open sourced a version of TensorFlow, and wide range of Google products and services. Node scheduling and placement algorithm were not sufficient enough to decide where to execute different node and when to execute

[5] Sergio Robles-Serrano, German Sanchez Torres "Automatic Detect on of objects based on the reflection principle. However, a fundamental flaw of IR sensors is their decreased effectiveness with darker colored vehicles. This is due to the absorption of IR rays by darker colors

[6] Victor Adewopo, Nelly Elsayed "Smart City Transport on: Deep Learning Ensemble Approach for Traffic Accident Detection" 2023 The detection on method of car accidents is based on CCTVIS. Real- me performance is low.

[7] Loganathan, M.E, G. Ajay Kumar, S.T. Chandru, Hari Rajan "vehicle accidents detection and notification system using lorawanr" Information about a accidents is transmitted via a GSM modem, eliminating the need for an internet connection to notify the rescue team. This system feature is particularly advantageous in areas lacking 3G or WiFi coverage. IR sensors detect detecting an accident, the system initiates a countdown for up to 10 seconds, during

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which you have the option to cancel it. Subsequently, it initiates a CALL to the emergency department. This remarkable feature serves to prevent the system from generating false alarms, ensuring its utmost reliability and accuracy. Different iterations of mobile phone models exhibit varying degrees of sensitivity, thereby influencing the efficacy of this system across the board. In addition to such sensitivity disparities, the processors embedded in these diverse models are endowed with distinct processing speeds and response times, thereby potentially impeding the timely and accurate detection of accidents.

[8] Mari kirthima, rishabh verma, chinmayi rajashekar hegde, arundhati s shanbhag "intelligent accident prevention in vanets " In this system, a vehicular ad-hoc network (VANET) is utilized to transmit accident alerts to rescue services. VANET also assists these services in determining the most efficient route to the accident site through the use of the Abeona algorithm and a traffic signal module. This functionality can significantly reduce the response time for an ambulance to reach the accident location. Vane may encounter efficiency challenges in various road scenarios such as intersections, underpasses, or tunnels. Additionally, its performance might be affected by diverse environmental conditions, inclement weather such as rain.

[9] including Mohd Akram Khan, Nirbhay Pandey, Prof. Ajay Kumar Srivastava, Er. Shadab Ali" accident detection and alert system using android application" After TrafficAccidents from Video Using Deep Learning Techniques"-2021 Use of GSM module and GPS for local on tracking. Lack of communica on mode with medical on department to provide hospitality to victims at accidental spot alarms, ensuring its utmost reliability and accuracy.

[10] H. C. Impana, M. Hamsaveni, H. Chethana "A Review on Smart Helmet for Accident Detection using IOT Uses Sensors that are interfaced with PIC through the wires. Sensors such as gas sensor, load sensor, vibration sensor, IR sensor and mems sensors are used. Ensure good fallen detection of the workers in working place. Exactness and accuracy is high.

Car Accident Detection and Notification System Using Smartphone

Traffic accidents are a major cause of death worldwide. To reduce fatalities, it's crucial to quickly detect accidents and dispatch emergency responders. While in-vehicle systems exist, they can be expensive and inaccessible to many drivers.

Smartphone-based accident detection systems offer a more affordable and accessible solution. By leveraging the processing power and sensors in smartphones, these systems can detect accidents based on factors like vehicle speed and G-force. However, many accidents occur at low speeds, making detection more challenging.

This research proposes a two-phase system that can detect both high-speed and low- speed accidents. The detection phase differentiates between vehicle movement and pedestrian activity, improving accuracy. The notification phase, triggered by an accident, sends vital information like images, videos, and location to emergency responders. This system has been tested in real-world simulations and has shown promising results.

III. PROPOSED SYSTEM

We propose using a Convolutional Neural Network (CNN) algorithm to detect accidents from live video feeds from highway CCTV cameras. Each video frame will be processed by the trained CNN model to classify it as either an accident or a non- accident scene. CNNs are known for their speed, accuracy, and reduced preprocessing requirements, making them well-suited for this task. In fact, CNN-based image classifiers have achieved over 95% accuracy on smaller datasets.

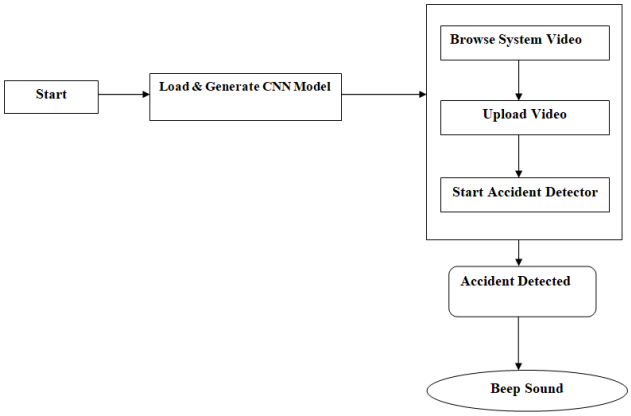

Figure: Block diagram

IV. IMPLEMENTATION

1 .Start: The Process Initiates

2. Load & Generate CNN Model: The Pre-trained CNN Model, Designed To Recognize Accidents, Is Loaded Into The System.

3. Browse System Video Or Upload Video: The User Can Either Select A Video File From Their System Or Upload A New Video For Analysis

4. Start Accident Detector: The System Starts Processing The Video, Analyzing Each Frame Using The CNN Model.

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5. Accident Detected: If The Model Identifies An Accident Within The Video Frames, It Triggers An Alert

6. Beep Sound: A Beep Sound Is Emitted To Notify The User Of The Detected Accident.

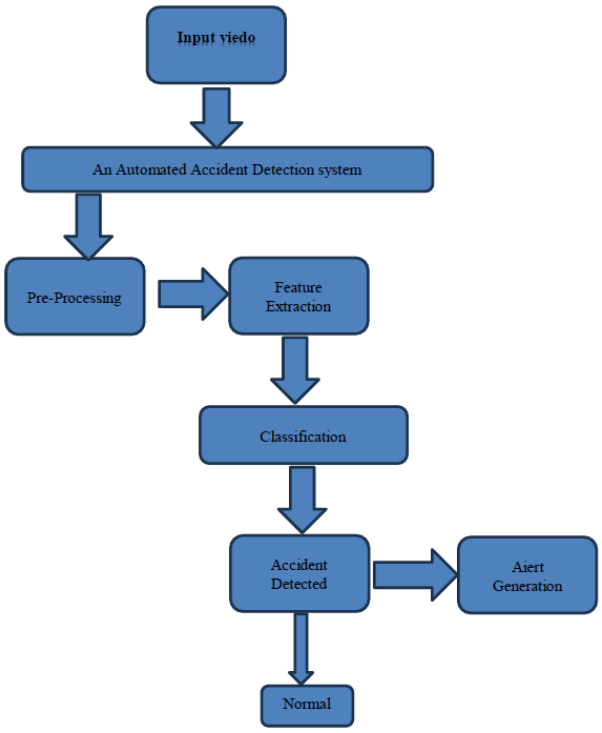


Figure 2: Proposed Architecture

1. Input Video: The system takes a video feed as input, which could come from a dashboard camera, traffic surveillance camera, or other source.

2. Pre-processing: The video frames undergo pre-processing steps like noise reduction, image enhancement, and possibly object detection to isolate relevant areas of interest.

3. Feature Extraction: Features relevant to accident detection are extracted from the processed frames. This might include things like vehicle speed, sudden changes in motion, presence of pedestrians, or road conditions.

4. Classification: The extracted features are fed into a classification algorithm, which determines whether an accident has occurred. This could be a machine learning model trained on a dataset of accident and non-accident scenarios.

5. Accident Detected: If the classifier detects an accident, it triggers the alert generation process.

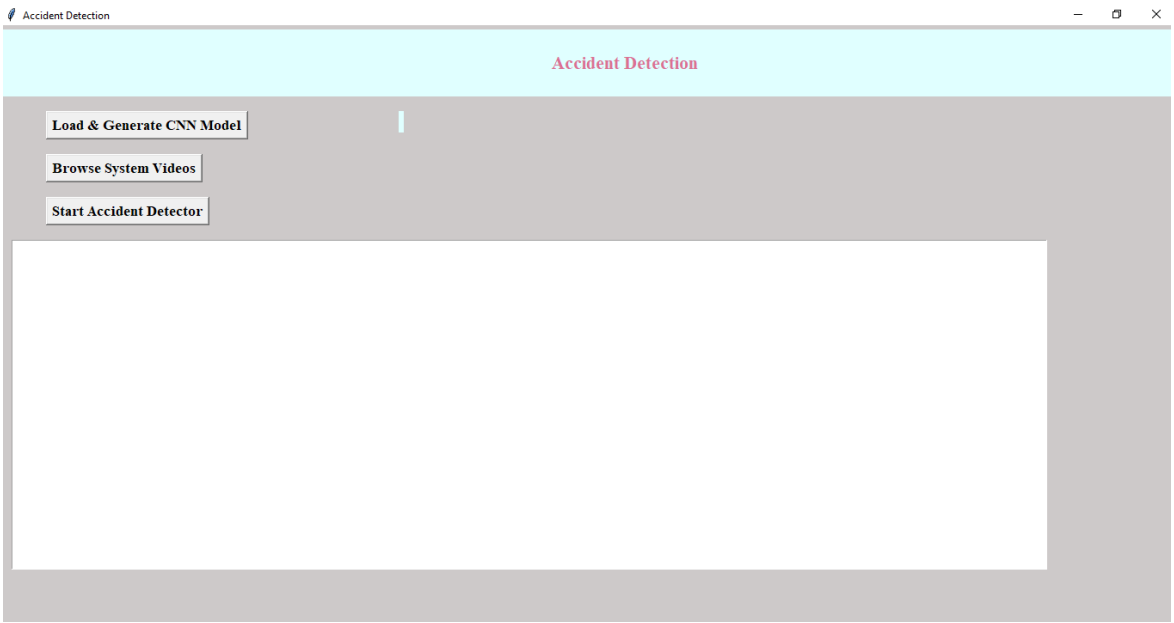
6. Alert Generation: An alert is generated, which could involve notifying emergency services, sending a message to a designated contact, or activating an alarm system.

7. Normal: If no accident is detected, the system continues monitoring the video feed.

V. RESULTS

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



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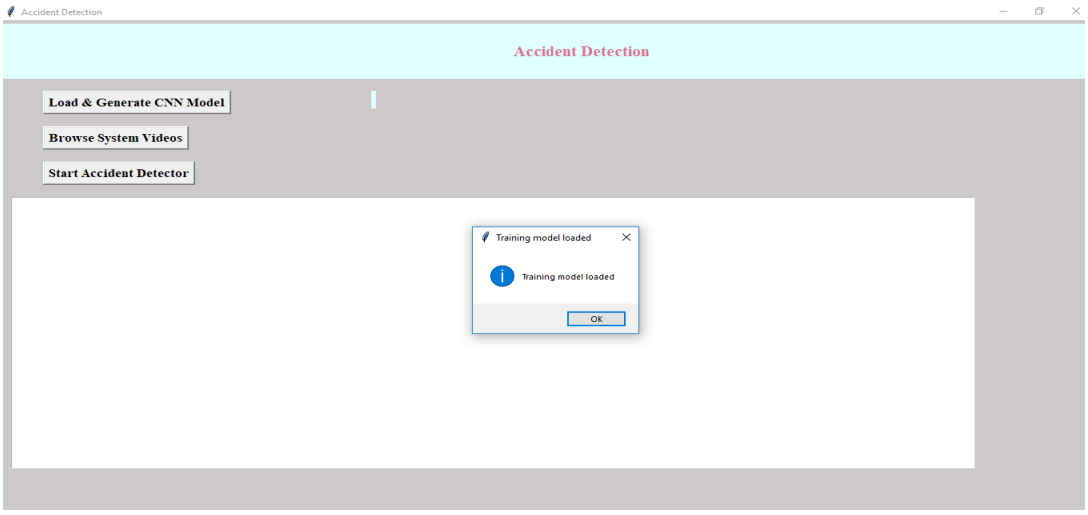
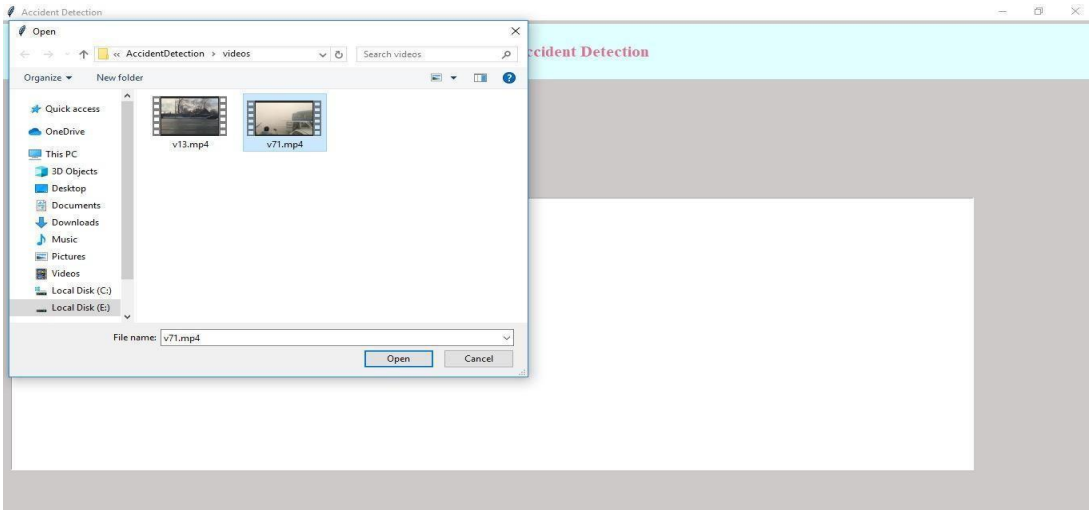
In above screen click on 'Load & Generate CNN Model' button to trained CNN with dataset and to load CNN model using tensor flow



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



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.

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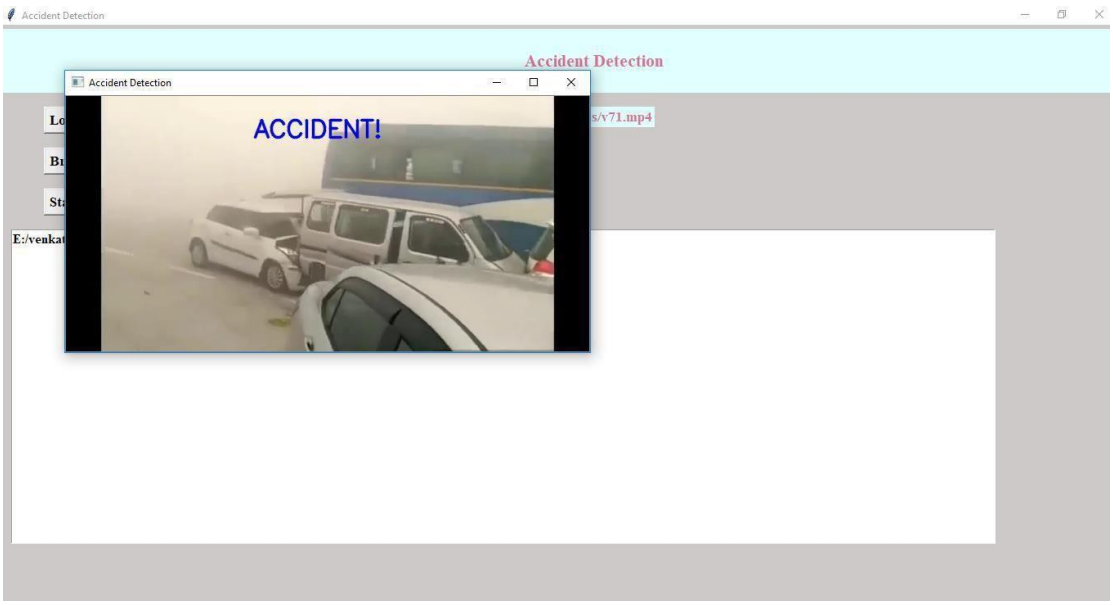
In above screen video start playing and upon accident detection will get below screen with beep sound.



In below screen playing another video without message if normal driving appear.

VI. SYSTEM OVERVIEW

System Benefits

1. Improved Road Safety: The system can detect accidents in real-time, enabling prompt response and improving road safety.

2. Reduced Latency: The system minimizes latency in detecting accidents, enabling faster response times.

3. Increased Efficiency: The system automates the process of detecting accidents and processing insurance claims, increasing efficiency.

System Requirements

1. Hardware: High-performance computing hardware, such as NVIDIA GPUs, to support CNN model processing.

2. Software: Deep learning frameworks, such as TensorFlow or PyTorch, to support CNN model development and deployment.

3. Data: Large datasets of video footage showing accidents and non-accident scenes to support CNN model training and testing.

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VII. CONCLUSION

One of the most frequent issues that humanity encounters on a daily basis is accidents, which result in the loss of both life and property. The suggested system offers a very practical and efficient solution to this issue. The proposed vehicle accident detection system has the ability to monitor accidents as they happen.

The proposed system is significantly more cost-effective, foolproof, and accurate than its competitor thanks in large part to a model-based approach, unlike other systems in use that comprise expensive sensors and unnecessary hardware. Images have been used in the experimentation, testing and validation, and the results demonstrate that this method does indeed achieve higher sensitivity and accuracy; as a result, it is a viable option for implementing this system on the majority of the state and national highways in the country.

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