Accident Detection and Warning System

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Abstract:- Roads are monitored via way of means of CCTV cameras passively i.e. expertise isn't always generated via way of means of the CCTV cameras. Human useful resource constraint i.e. there may be the very restricted posting of the visitor's police personnel at road crossings, highways, and far off places. In many cases, injuries are happened because of negligence via way of means of the pedestrian and being stranded in far-off places. Adding to this, even the bulk of human beings surrounding the coincidence scene are busy clicking photographs and videos ignorant of the truth that their little negligence should value a life. The photos are available to the government agencies after trouble has happened. To conquer this, we endorse a wise device that could employ the prevailing CCTV cameras with nighttime vision. The proposed device captures the video stream, computes the input, and the device signals are generated in real-time, because of this that no extra sensors could be required. Using the digital digicam itself, the plan is to discover injuries in real-time and additionally send signals to ambulances or firefighting services; in order that suitable assets wished for saving lives are to be had in time. In many cases, injuries are suggested as a result of negligence on the part of street customers and being stranded in remote locations. Furthermore, the vast majority of people in the vicinity of the accident scene are preoccupied with taking photographs and videos, oblivious to the fact that their inattention could cost a life. To overcome this, we recommend a clever gadget that can make use of existing CCTV cameras with night vision.

Keywords:- *Convolutional Neural Network, ResNet, Traffic net, openCV, LSTM, GPS, REST.*

I. INTRODUCTION

More than one million people died in various traffic accidents around the world, and many people suffered minor injuries. Many studies have shown that many developing and underdeveloped countries have the highest road traffic accident death rates, even though these countries only account for half of the world's vehicles. According to the data available in India, there is an average of 13 deaths per hour, that is, 140,000 deaths per year. The main goal is to enable the system to detect accidents based on the video sequence transmitted by the camera. A tool that helps accident victims who need it by detecting the accident early and notifying the authorities from then on. The goal is to detect accidents in seconds by using advanced deep-learning algorithms that use convolutional neural networks (CNN or ConvNet) to analyze the frames from the video generated by the camera. We focus on installing the system on busy roads. Incomplete and timely assistance to accident victims is rare. On the street, we can install CCTV cameras. In this camera, we can set up a proposed system that will take shots from CCTV cameras and run them on the proposed collision detection model to detect accidents. In the event of an accident, response time is of the utmost importance, and assistance is provided every additional minute since arrival can determine life and death. A system is needed that can automatically detect and track traffic accidents, and quickly report them to relevant departments to respond to emergencies more quickly. Thousands of lives The computing power of modern CPUs makes many complex real-time applications possible. One of the most common real-time applications is video surveillance systems. CCTV systems reduce the presence of people following the actions recorded by cameras. One of the advantages of the visual observation system can be saved and analyzed. Future reference One of the most important applications of video surveillance systems is traffic monitoring. The traffic monitoring system is used to detect, track, evaluate traffic flow, determine vehicle speed, classify vehicles, etc.

II. RELATED WORK

A. Accident Detection using Convolutional Neural Networks.

Sreyan Ghosh, Sherwin Joseph Sunny and Rohan Roney[1], "Accident Detection using Convolutional Neural Networks". CNN's are used in the modeling of spatial data such as photographs. CNN had been successful in tasks such as photo classification, item detection, and so on. LSTMs are algorithms that are used to model sequential data and make predictions based on it. LSTMs are widely used in the textual content category for creating language models, series generation, and so on. Standard LSTMs can be applied to sequential data with a spatial center right away. As a result, a CNN-LSTM structure is desired to carry out tasks involving photo or video sequences. For non-stop video taken from a camera, the proposed version is a fusion of CNN and LSTM layers. The CNN portion of the proposed version was particularly stimulated by Inception v3, but with a few tweaks, it has fitted well to our education photographs. The LSTM layers have been added to the existing Convolution Network to recall temporal as well as spatial capabilities. This is further divided into the version's convolution and recurrent elements. The CNN is frequently used in a CNN-LSTM network for function extraction from photographs, which is then passed directly to the LSTM for series prediction. They are widely used in tasks such as activity recognition, image description, and video description, among others.

B. Accident Detection, Severity Prediction, Identification of Accident Prone Areas in India and Feasibility Study using Improved Image Segmentation, Machine Learning and Sensors.

"Accident Detection, Severity Prediction, Identification of Accident Prone Areas in India and Feasibility Study using Improved Image Segmentation, Machine Learning and Sensors"[2], In this paper, The system provides a three-stage solution that uses machine learning and computer vision to analyze traffic accidents in India. The solution is through the classification of car accidents. This step can be accomplished by using any object detection and image segmentation algorithm. We experimented with the You Look Only Once (YOLO) algorithm. However, the probability of accident misclassification is as high as, which becomes a major problem when using real-time data. Image segmentation is an alternative method of classifying car accidents. We experimented with the watershed algorithm, the cunning edge detection, and the cunning automatic algorithm for separating cars from accidental cars. The YOLO algorithm found that the limitation is that the region of interest is satisfactory, but it was misclassified and lost some of the cars indicated in the input video image. Cunning edge detection performs best in car accident classification and has a very interesting area, making it suitable for good preprocessing technology for image enhancement of car accident images.

C. Ubiquitous GPS Vehicle Tracking and Management System.

Iman M. Almomani, Nour Y. Alkhalil, Enas M. Ahmad and Rania M. Jodeh[3], "Ubiquitous GPS Vehicle Tracking and Management System", This document proposes a system to make vehicle tracking more accessible to individual users and fleet companies. The proposed system provides not only traditional web-based tracking software but also mobile software for tracking anytime, anywhere. Services for a variety of users. This system allows people to track the position, speed, stop, and movement of their vehicles. The monitoring process includes real-time tracking of location or collection of historical reports on vehicle movement, setting speed, and geographic limits. Services (GPRS) Global System for Mobile Communications (GSM) Internet or World Wide Web and Global Positioning System (GPS)

D. Improving Estimation Of Vehicle's Trajectory Using the Latest Global Positioning System With Kalman Filtering

"Improving Estimation Of Vehicle's Trajectory Using the Latest Global Positioning System With Kalman Filtering"[4] Predicting a vehicle's future location with accuracy is a critical but difficult problem in intelligent transportation systems.It can be advantageously employed in car or robot obstacle avoidance systems.Many of the currently being researched obstacle-avoidance systems are limited to line-of-sight sensors. Much research looks into the possibility of using GPS data received from various vehicles to forecast where each car will be in the future.

The methods used to construct these predictions are rather simple, and they do not produce particularly accurate results in cases where the predicted future position of the vehicles is not a straight route, such as curves. The current research shows that we need a better technique to anticipate the trajectory of vehicles in a variety of conditions. The Kalman filter (KF) is used in this situation. The KF has a long history of reliably predicting future states of moving objects, and it has been used in a variety of applications.

III. PROPOSED SYSTEM

The proposed model is a fusion of CNN and LSTM layers for the classification of continuous video captured from the camera. The CNN part of the proposed model was mainly inspired by the ResNet-50 but fit well with the training image through certain adjustments. The LSTM layer has been added to the existing Convolution Network to take into account spatial and temporal characteristics. This is divided into a convolution part and a recurrent part of the model. CNN-In the LSTM network, CNNs are primarily used for image feature extraction and are passed to LSTMs for sequence prediction. Widely used for tasks such as activity recognition, image description, video, description, etc. CNN is used to model spatial data such as images. CNN has been successful in tasks such as image classification and object detection. The LSTM is used to model sequential data and make predictions based on it. LSTMs are widely used in areas such as text classification, language modeling, and sequence creation. The standard LSTM can be used directly on the input space, sequential data. So, if you want to work with a series of photos or videos, you need to use the CNN-LSTM architecture. In the GPS, various characteristics such as current location data, vehicle speed, and direction are taken into account in the prediction. When the machine learning model detects an accident, the proposed system sends an alert to the appropriate authorities and nearby vehicles.

IV. METHODOLOGY

We collected datasets from an online data store called traffic-net, which categorizes datasets as accidents, crowded traffic, fires, and sparse traffic. This is part of DeepQuest AI that trains you to recognize, understand, and fix problems accordingly in all environments where machine learning systems are deployed. Contains 4400 images containing 4 classes. There are 1,100 images in each of the categories, and 900 educational images, and 200 test images. An Android application was used to alert real-time. The coordinates of the incident are sent to the Android client user and compared with the user's location. this helps users make appropriate decisions.

A. Architecture

The video stream from CCTV is directly sent to a pre-processing part. This preprocessing is carried out by openCV library, which converts the video into frames of images. These images will be sized and formatted in order to be compatible with the ResNet-CNN model.

The CNN model used here is a ResNet50[5]. which is implemented on a highly functional computer system with a high clock rate. These CNN models are system independent hence migration and implementation to any other machine including cloud computing systems are hassle free. An android application will be used for the user interface. The alert system uses REST API for communicating with users and appropriate authorities over HTTP protocol. A relational database stores user's data.

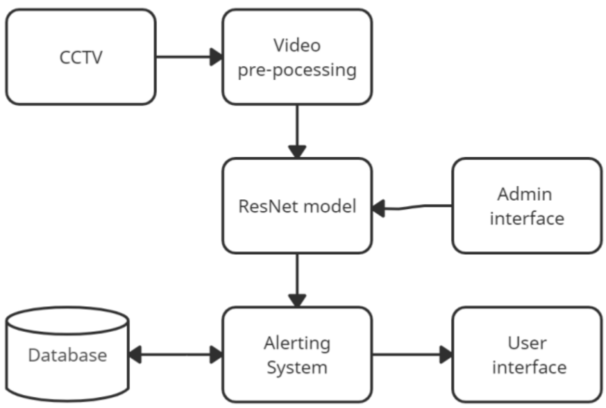

Fig 1. Architecture

B. pre-processing

The collected data set is pre-processed before feeding it into the CNN model. This preprocessing makes the data compatible for the model and also keep it homogeneous. The pre-processing is carried out using the openCV library. This library is available in python.

C. Building And Training The ResNet-50 Model

For the main implementation of the ResNet-50 model architecture, an open source library called imageai is used. ResNet-50 is a 50-layer deep convolutional neural network. A pre-trained version of the network trained on over a million images from the ImageNet database can be loaded. The pretrained network can categorise images into 1000 different object categories.As a result, the network has learned detailed feature representations for a diverse set of images. The network accepts images with a resolution of 224 by 224. The below image show a conceptual architecture of ResNet.

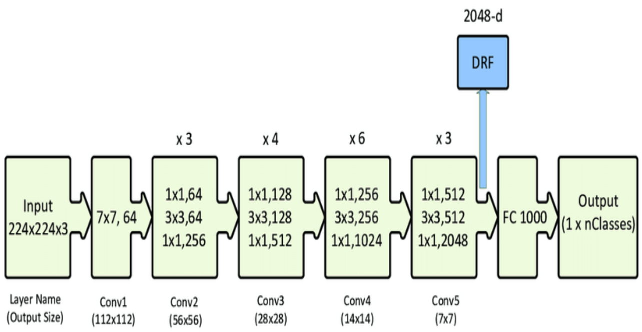

Fig 2. ResNet-50

This model is trained using the collected datasets. The training is conducted in a supervised learning fashion where the example data sets along with its class value is fed into the model for its learning. for training the model image frames of collected data sets are used, which are preprocessed to fit the models dimensions and pixel resolution.

D. Alerting system

The alerting module checks the ResNet model's output in realtime, if the probability of an accident is high it sends alerts towards the user. We use an android application for client side. The coordinate of accident location is forwarded to the android application, along with it alert messages are passed to emergency response teams like ambulance and fire engine. To communicate with the android application the alerting system which is written in python uses REST API. When the location of an accident is passed, the user can then choose to take a different route if he wishes to.

V. RESULT

The following are the results we got during the testing of model on unseen data.

```
Dense_Traffic  :  100.0
Accident  :  9.411973422857045e-07
Fire  :  2.656607822615342e-07
Sparse_Traffic  :  4.631924704900925e-09
```

Fig 3. image frame with Dense traffic

```
Accident  :  99.94832277297974
Sparse_Traffic  :  0.04670554480981082
Fire  :  0.004610423275153153
Dense_Traffic  :  0.00035401615150476573
```

Fig 4. image frame with accident

VI. CONCLUSION

Accident detection operation is not an easy task to handle; it can be an extremely complicated process when it comes to real time applications, which is the main reason why it is not implemented yet on a large scale. The proposed system will help to improve the present scenarios. Although an in-vehicle accident detection system provides emergency responders with essential information as fast as possible but unavailability of this system are restricted by their non-portability and costs.The proposed vehicle accident detection system can track an accident at its moment of occurrence. Compared with other deployment systems composed of expensive sensors and unnecessary hardware, the proposed system is more economical, more reliable, and more accurate than similar systems, mainly due to the model-based approach.

VII. FUTUREWORK

In the future , we can combine both supervised and unsupervised methods together to improve the system . We can use supervised learning models to identify the accidents from the frames which are flagged anomalously by unsupervised models.

More sophisticated methods for tracking accident happened area. Algorithms like kelman can be used to predict the potential of a vehicle passing through the accident happened place. this will help the driver to avoid incident happen area and evade a potential traffic jam.

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