A Mini Project Report

On

ACCIDENT DETECTION AND ALERT SYSTEM USING DEEP LEARNING

(Submitted in partial fulfillment of the academic requirements of B.Tech)

In

Department of Computer Science and Engineering

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An Autonomous Institution

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CERTIFICATE

This is to certify that the project report entitled "**ACCIDENT DETECTION AND ALERT SYSTEM USING DEEP LEARNING"** being submitted by

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in partial fulfillment for the award of the degree of Bachelor of Technology in Computer Science and Engineering, Jawaharlal Nehru Technological University Hyderabad, is a record of bonafide work carried out under my guidance and supervision. The results embodied in this project report have not been submitted to any other University or Institute for the award of any Degree or Diploma.

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DECLARATION

I declare that this project report titled **ACCIDENT DETECTION AND ALERT SYSTEM USING DEEP LEARNING** submitted in partial fulfillment of the degree of **B. Tech in Computer Science and Engineering** is a record of original work carried out by me under the supervision of **Mrs. B. K. Madhavi**, and has not formed the basis for the award of any other degree or diploma, in this or any other Institution or University. In keeping with the ethical practice in reporting scientific information, due acknowledgements have been made wherever the findings of others have been cited.

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ABSTRACT

Title: **Accident Detection and Alert system using deep learning**

In today's generation as the population is increasing the no of vehicle's are also increasing which may cause accidents this can be deep learning and datasets .In these days the purchasing power of automobiles also increased a lot. And in some cases due to recklessness its leading to traffic hazards or road accidents which is leading casualties of human lives. And when accidents occur there may be delay of reaching ambulances to the location ,to detect accidents and alerts the nearest ambulance services and as well alerts the guardians of the victim. The system makes use of camera to detect the severity of the accidents and send the data to Database where our software which act as a layer scans and looks for the correctness by using deep learning. once the data is verified the **Keras OCR** scans the plate number and checks the data which is present in data base once the data is retrieved the corresponding SOS message is sent to guardians and nearby ambulance services and as well the location of the accident.

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ABBREVATIONS/NOTATIONS/NOMENCLATURE

SMTP: Simple Mail Transfer Protocol

YOLO: You only look once

CNN: Convolutional neural network

SSD: Single Shot Detection

OCR: Optical Character Recognition

CHAPTER 1
INTRODUCTION

This chapter contains brief description of the project, this project mainly deals with accident detection and alert system

Accident detection: In today's age the population is increasing along with the demand for vehicle's is also increasing, in some cases due to reckless driving it leads to traffic hazards or road accidents which puts human lives in jeopardy. According to **World Health Organization (WHO)** Approximately 1.3 million people die each year in road accidents.

Motivation.

India recorded 1.2 lakh cases of "deaths due to negligence, resulting to road accidents" in 2020, with 328 persons losing their lives every day on an average, despite the COVID-19 lockdown, according to government data.

As many as 3.92 lakh lives have been lost in three years in deaths due to negligence related to road accidents, the National Crime Records Bureau (NCRB) revealed in its annual 'Crime India' report for 2020. While 1.2 lakh deaths were recorded in 2020, the figures stood at 1.36 lakh in 2019 and 1.35 lakh in 2018, the data show

Reason for road accidents

Drivers: Over-speeding, rash driving, violation of rules, failure to understand signs, **fatiguealcohol**.

Pedestrian: Carelessness, illiteracy, crossing at wrong places moving on carriageway, Jaywalkers.

Passengers: Projecting their body outside vehicle, by talking to drivers, alighting and boarding vehicle from wrong side travelling on footboards, catching a running bus etc.

Vehicles: Failure of brakes or steering, tyre burst, insufficient headlights, overloading, projectingloads.

Road Conditions: Potholes, damaged road, eroded road merging of rural roads with

Even after the advancement in technology the mechanisms used to prevent road accidents are still the same that was implemented decades ago like road signs, speed breakers etc. The usage of digital and electronic devices has increased at a wider range.

Automobiles are important to go to workplaces, meet family and friends and to deliver goods. But often they pave the way to big disasters. According to Wikipedia, accidents are an unforeseen and unplanned event or circumstance, often with lack of intention or necessity. Road accident is most unwanted thing to happen to a road user, though they happen quite often. The most unfortunate thing is that we don't learn from our mistakes on road. Most of the road users are quite aware of the general rules and safety measures while using roads but it is only the laxity on part of road users, which cause accidents and crashes. Main cause of accidents and crashes are due to human errors. Following are the major reasons of accidents: 1. Over Speeding 2. Drunken Driving 3. Distractions to Driver 4. Red Light Jumping 5. Avoiding Safety Gears like Seat belts and Helmets 6. Non-adherence to lane driving and overtaking in a wrong manner.

Objective Of Project:

the main objective is to detect the accidents by sending a message to the registered mobile using wireless communications techniques. When an accident occurs at a place, the message is sent to the registered mobile number The proposed system will check whether an accident has occurred and notifies to nearest medical centers and registered mobile numbers about the place of accident

Training the dataset:

The data have been collected using several sources like google chrome, videos and this data is labeled as accident and non-accident using labeler application where the coordinates of the object is stored to xml format with same file name and this data is used to train a convolutional neural network(CNN) model using tensorflow 2.0

Dataset used for training:

For developing effective accident detection system. collection of data set from CCTV surveillance videos is necessary. Data set must include videos of accident cases for various conditions. Further, availability of public data set is also necessary so that other researchers can compare their results. Size of data set also matters as larger data set will be helpful to generalize results obtained during the research.

Unfortunately, data sets used in most of the methods for testing are either small in size, private and not available for comparison. Therefore, solutions suggested by these methods cannot be generalized. To overcome this we have collected data from various sources such as google, you tube etc.

Working of the system:

Practically all the major urban communities over the world have already introduced noteworthy cameras for traffic checking. Making use of these already installed observation camera systems will be a feasible solution.

Detecting road accidents automatically from the traffic surveillance CCTV video is an exceptionally attractive but challenging task. Over the years, research community as well as industry scientists have been attempting to develop a solution for automatic detection of accident using video processing techniques. We make use of cctv footage to scan the data and then our system detect the accident using the trained data

If there is an accident detected the system will try to retrieve the numberplate of the vehicle once the number plate is retrieved the system go and scans the registered users info in the data base and the accident details are send to registered trustee's mobile. Most important factor in detecting accident is to track all the vehicles.

Number plate detection:

Automatic Number Plate Detection plays a vital role in this model. It greatly helps the different services to save their time by automating the process. In earlier days vehicle number plates were identified using template matching techniques by identifying the width, height, contour area etc. Now several deep learning models are trained over an enormous amount of data is widely used in number plate detection

CHAPTER-2
EXISTING METHODOLOGY

This chapter contains brief description about the existing system of the current working project. This section contains few drawings and graphical illustrations.

In a globalized world people are highly dependent on automobiles on a daily basis. There might be some billions of vehicles on the roads and due to recklessness of driving there are millions of casualties causing day by day around the world. The road crash injuries and the lack of immediate medical attention leads to deaths. So, to avoid too many casualties' different methodologies are implemented through technology. The existing system mainly deals with detecting the accidents and rescue the victims through INTERNET OF THINGS(IOT). The system makes use of accelerometer sensor signal which is used to detect severe accidents due to some obstacle. It makes use of smart devices and helps to build an automated system with programmable and remote-controlled appliances. Hence the components are combined with internet connectivity and data analyzing capabilities. The existing system helps in providing faster communication to the ambulance services which helps in faster medical aids to the victim as soon as possible. when the accident occurs, the system analyzes the severity of the accident and sends the message to the rescue team which helps the rescue team to arrive to the spot as early as possible and provide medical aid to the victim. The existing system is used for detecting the accidents which helps in reducing the loss of life due to accidents and it also helps in reducing the time taken for the ambulance to reach the accidental spot. The system makes use of accelerometer sensor to detect the severity of the accidents which is present in the rescue system and with the help of GSM module the messages about the location of accident and its severity is sent to all the nearby rescue team in that specific location. This helps the emergency help team to immediately track the location with the help of GSM module. once the accident location information is received it will help the rescue team to take action immediately. The rescue team that arrives on spot as early as possible provides the first aid to the victim and an alert is sent to all the other rescue team that received the SMS stating that the victim has been rescued. This detection of accidents makes use of microcontroller which consists of accelerometer sensor, display, GSM module and alarm.

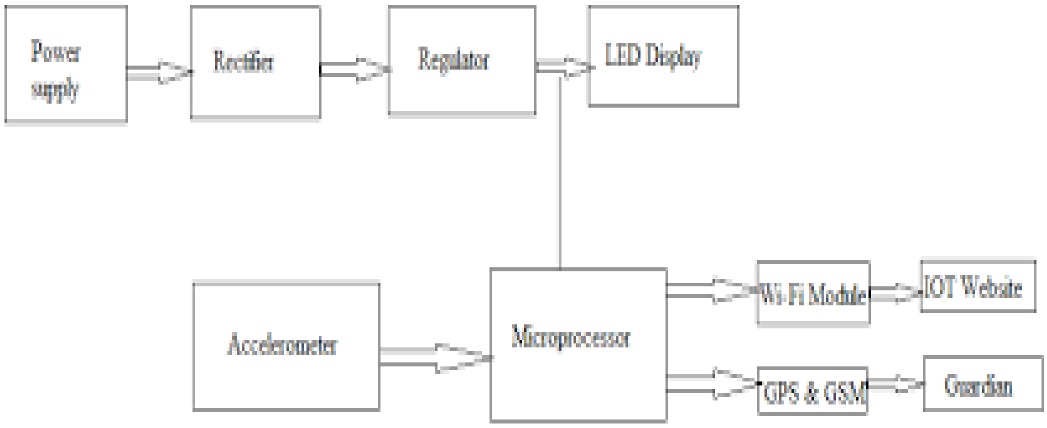


FIG 2.1 SYSTEM ARCHITECTURE

ACCIDENT DETECTION:

The existing system uses the accelerometer sensor which detects the accidents based on the severity of the accident. The severity is determined based on the vibration frequency of the accident. The readings are monitored continuously by the accelerometer. And if there is in increase or decrease in the speed above some certain value or a threshold value and as well if there is any change in the angle of the sensor then it detects as an accident.

Detection of severity and rescue:

The vibration sensors are equipped with the Raspberry pi system which is used to sense the vibration frequency of the accidents. A maximum vibration frequency limit is set in the Raspberry Pi model and when the frequency exceeds the limit means the accident has occurred. The rescue team that arrives at the earliest will rescue the victim at the earliest and an alert will be sent to the other nearby rescue teams that the victim has been rescued.

And in this system few hardware components/sensors are also used for detecting the speed of the moving vehicles.

HARDWARE COMPONENTS USED:

MICROCONTROLLER:

Microcontroller consists of the programmable information of the peripherals. It consists of CPUs along with the memory to store the programmable information. Microcontrollers are used in wide array of systems and devices. Devices often utilize multiple microcontroller that work together within the device to handle their tasks. This microcontroller is embedded inside of a system to control a singular function in a device. It interprets the data and receives from its input output peripherals using its central processor.

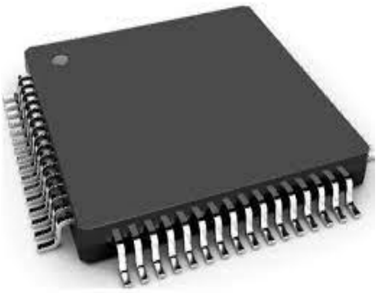


FIG 2.2 MICROCONTROLLER

CRYSTAL OSCILLATOR:

Crystal oscillators are commonly used in low-power IoT devices to provide an accurate timing reference. Crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a constant frequency. This frequency is used to keep track of time. These are also used to stabilize frequencies for radio transmitters and receivers. The crystal oscillator is relied on slight change in shape of a quartz crystal under an electric field. The oscillator is used to maintain frequency by creating electrical signal. In this existing system crystal oscillators are helpful in tracking the time when an accident occurs.

FIG 2.4 CRYSTAL OSCILLATOR

WIFI MODULE:

Wi-Fi module also known as serial to wifi module, which belongs to the transmission layer of the IOT. Wi-fi module helps the microcontrollers to connect to a wi-fi network. This system makes use of Wi-fi module to continuously stay connected to a network.

FIG 2.6 WIFI-MODULE

STORAGE IN CLOUD:

This distributed storage helps in continuously piling all the information to the cloud and retrives the information when required.

FIG 2.7 A CLOUD STORAGE SYSTEM

GSM MODULE:

So generally talking about GSM is abbreviated as G**lobal System for Mobile Communication (GSM).** It is developed by European telecommunications standard institute. Generally, this GSM module is a wireless communication standard for mobile telephone systems. And this GSM module even describes about protocols for the second-generation digital cellular networks for mobile phones and now the default global standard for mobile communications- with over 90% market share, operating in over 219 countries and territories. This ubiquitousness means subscribers will use their phones throughout the globe, enabled by international roaming arrangements between mobile network operators. GSM differs from its forerunner technologies in this each sign and speech channels are digital, and therefore GSM is taken into account a second generation (2G) transportable system. In this system GSM module is used to track the location when the accident occurs. Hence with the help of this module when the accident occurs the message is been sent to the nearby rescue teams.

FIG 2.8 GSM MODULE

ACCELEROMETER SENSOR:

So, the accelerometer sensor is an electronic sensor that measures the acceleration forces acting on an object. Acceleration is a vector quantity, is the rate of change of an object’s velocity. The force caused vibration or a change in motion causes the mass to squeeze the piezoelectric material which produces an electric charge which is proportional to the force exerted upon it. Since the charge is proportional to the force, and the mass is constant then the charge is also proportional to the acceleration. In this system this sensor is used to monitor and detect the vibration of a rotating machine. This sensor is also capable of detecting the direction and magnitude of the acceleration which is used to sense the vibration or shock in a medium since the acceleration starts at zero and it increases gradually. Hence this system makes use of this sensor to detect the severity of the accidents.

FIG 2.10 ACCELEROMETER SENSOR

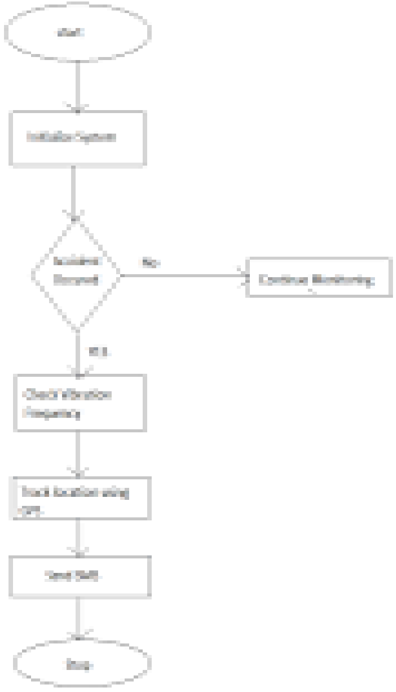


FIG 2.11 WORKING PRINCIPLE

The existing system mainly works on the principle of GSM and as well accelerometer which helps victims survive from the accident as soon as possible. When there is a tilt in the car based on the vibrating frequency the sensor will detect that the accident has occurred. The sensor then communicates to the microcontroller. Based on the position of the vehicle the system detects that accident has occurred and with the help of GSM module the message will be sent to the rescue team. The existing system only uses the information about the vehicle's vibrating measurements to detect the accident. If vehicle is normal, no messages has been sent to rescue team. Whenever accident occurred, the sensor detects the accident happened with vehicle. The controller get the input from sensors and send the accident alert information to road side unit and then message is sent to the rescue team and also WIFI and GPS finds location of the vehicle and that also send to the rescue team.

The main drawbacks of the existing system are that we need to install hardware components like microcontroller, crystal oscillator, wi-fi module, and few other sensors into the vehicle. By this in some cases the IOT devices may get damaged. And another drawback of this existing system is that we need to install these IOT devices into millions of vehicles which is a difficult task, time consuming and as well cost effective.

This current system also has a drawback of mobility, because IoT is expected to offer services to the mobile users as well. It continuously needs to connect the users, in order to provide better services. In some cases, the users or victims may not be connected to network. So therefore, the users need to join the nearby network without any previous configuration.

As we know the existing system is highly dependent on IOT devices and as well the IOT devices are relied on **Internet.** So in some conditions the devices may not function properly without internet. And with the complexity of the systems, there are many ways for them to fail.

The other drawback of this system is that the here the IOT devices are interconnected and communicated over networks. So here the system offers little control despite any security measures, and it can be lead to various network attacks.

CHAPTER 3
LITERATURE SURVEY

An innovative method inspired by motion of water waves to model the interaction among multiple moving objects for detection of road accidents was developed by **Kimin Yunet al. [**1] When many objects move on the water surface the motion of water waves responding to them was the motivation for this method. Data sets are used for testing results were not made for public comparison. a novel method for real-time automatic detection of traffic accident was proposed [2]. Parameters extracted from the video form the basis of the system. Here, Gaussian Mixture Model (GMM) was used to detect the vehicles and mean shift algorithm was used to track the detected vehicles. After that, parameters, were gathered from the video The three significant parameters, the direction of the moving vehicles, the changes in the position of the vehicles and the speed of the vehicles were acquired to make the decision of accident.

Siyu Xia et al. used low-rank matrix approximation-based method for the detection of accident [3]. Approximation error was calculated for each block of frame and compared with defined threshold. Accidents were detected based on the comparison of approximation error with the defined threshold. Tested video segment was considered as normal, if the error was less than the threshold. Otherwise, it was labelled as a traffic accident. Similarly, a new detecting and positioning technique was addressed from the analysis of distribution characteristics based on average space occupancy, flow rate and average travel speed of traffic in a defined road segment [4]. In this method; every monitored lane segment was partitioned into a cluster of cells. By detecting and tracking traffic objects, parameters in each cell were acquired. This method was based on lawful traffic on highway. Accidents were detected based on congestion in a particular cell. Also, the data set used was private and hence, not available for comparison.

Additionally, an innovative method based on an adaptive traffic motion flow modelling technique was suggested [5]. In this method, Farneback Optical Flow was used for detection of motions and a statistic heuristic method was used for detection of accident. Threshold was varied in order to adapt changes in lighting conditions and traffic density. While testing results of the new system, only highway and expressway traffic patterns were considered. Database was small, private (self-created) and not available for comparison. Delay for processing video in this method is more so, it is not acceptable for real-time applications of accident detection and a 30 frame/sec camera. Moreover, a new accident detection module was proposed that used different parameters like velocity, area, position, direction, and inclination angle of the moving object [6]. These parameters were extracted from the detected and tracked vehicles. Accident Index was calculated based on these parameters and compared with threshold to detect an accident. Incidences on highways and intersections were only considered. Authors suggested that the machine learning could be used to improve performance of the module. A private data set was used.

Perceptual video summarization technique was addressed for vehicle analysis and accident detection form traffic surveillance videos by **Sinnu Susan Thomas** and other co-authors [7]. Optimal summary-based event detection provides a faster visualization. However, depth-based segmentation, multi-camera scenario and varying environmental conditions can be considered to improve performance. No clear information was given about the exact data set used and was not made public for comparison. Method introduced by **Yuanlong Yu** and other co-authors implemented three different modules: Low-level **spatio-temporal** feature, followed by sparse feature, and then W-ELM (Weighted-Extreme Learning Machine)-based detector [8]. The sliding window technique based on trained Kernel W-ELM classifier was used to determine whether each sliding window was a traffic accident scene or not. According to the author, there was a possibility of false detection in case of collision, and hence, more work was necessary in this issue. Enlargement of data set and supervised learning could be considered to improve the performance of the system.

Object Detection and Tracking System along with a popular deep learning network was addressed by **Kyu Beom et al**. [9]. With the help of this method, it was possible to detect an accident within 10 seconds for each frame containing accident. But testing of method was done only for the particular case where traffic pattern was simple. Also, for testing author had used a very small data set of videos and data set was not made public for comparison. For detecting accident, multi-modal deep learning method was used [10]. This method was verified on the real traffic from Hyderabad city in India.

Accident F detection rate of this method was about 77.5% and false alarms rate was 22.5% on real accidents videos. New data set (Indian Traffic) was made public for comparing results I obtained from the other method. The challenges that need to be addressed in future are occlusions, poor visibility at night and large variations in the normal traffic pattern.

TECHNIQUES OF ACCIDENT DETECTION:

1: Detection of road accident based on CCTV surveillance videos is mainly done by means of typical steps, which are motion detection, feature extraction, feature analysis, and accident recognition. Over the last few years, researchers have developed various systems to detect road accidents successfully. The strategies used so far for detecting traffic accident from CCTV surveillance videos can be classified into three categories, namely modeling of traffic flow patterns, monitoring and analysis of vehicle activities and modeling of vehicle interactions. Most important factor in detecting accident is to track all the vehicles. Various current strategies utilize motion of moving vehicles to define a typical baseline (mostly using pre-decided threshold) and frame of any anonymous video, which es not follow the baseline is assumed as an accident.

The fact is, deviations from motion parameters provide useful information before collision, but it is not sufficient for accident detection. Furthermore, with a dense traffic and sudden change in the motion, the task becomes more challenging.

Thus, the existing methods to solve the problem of automatic detection have their own means to define "ACCIDENT", which may lead to FALSE DETECTION in real life. Difference between collision and occlusion needs more attention.

DIFFERENT DATA SETS USED FOR TESTING:

For developing effective accident detection system, collection of data set from CCTV surveillance videos is necessary. Data set must include videos of accident cases for various conditions. Further, availability of public data set is also necessary so that other researchers can compare their results. Size of data set also matters as larger data set will be helpful to generalize results obtained during the research.

In some cases, the data sets which are used in most of the cases for testing are either small in size or private and not available for comparison. Furthermore, many of the methods are tested only on videos of lawful highway traffic or only on a particular type of cases. Hence, these techniques may not be implemented for random traffic pattern. Various lighting and weather conditions are required to be considered for testing reliability of a system as they may change the performance of system in different conditions.

Chapter 4
Problem Definition

Video synopsis is an activity-based video summarization method and the main goal is to present as many activities as possible simultaneously in the shortest time period. Nowadays, a huge amount of the multimedia dictionary makes the perusing, recovery, and conveyance of video content exceptionally moderate and even troublesome undertakings. Visual data like images and videos are easily accessible nowadays and play a critical role in many real-time applications like surveillance. but Accident detection may be a tougher task at the instant. Numbers of researches on accident detection have expanded over the past a long time. This study proposes the latest approaches in accident detection and video synopsis. We analyze existing processes in accident detection, video synopsis, and advance deep learning techniques. Nowadays, Visual information - like pictures and videos are used in day-to-day in regular life. occurrence of a highway car accident any significant length of time into the future is obviously not feasible, since the vast majority of crashes ultimately occur due to unpredictable human negligence and/or error. Therefore, we focused on weather that are conducive to the occurrence of car crashes, and using cctv videos these patterns to detect the occurrence of an accident .That contains vital data for addressing real-world issues in several domains like health care, surveillance systems, education, social media, etc. Control and supervision of giant amount of the recorded videos have become harder to accommodate every moving day once admitting the fast improvement in security camera usage in the manner of life. Video synopsis is a technique used to browse surveillance videos in an easy and fast manner [1]. It aims to provide a summarized video by dropping redundant frames from it. Video synopsis differs from other summarization techniques in a way that it provides activity-based video shortening instead of frame based video shortening. So it provides detailed video analysis. Some videos are of a very long time and browsing such lengthy videos is time-consuming if it contains redundant information in the subparts of a video. Video synopsis alleviates browsing videos for long and shortens the original video. It is important because most of the videos contain spatiotemporal repetitiveness where the same kind of activities occurs for a long period. Spatial information refers to video frame changes on time. Video synopsis uses activity as a preprocessing unit instead of frames

All most cities already installed video surveillance systems everywhere for security purposes, to watch any activity or accident manpower and time is required. However, nobody has such free time to watch the full video and get bored. Therefore, some automated systems as required which can replace full video into small videos. This system needs to be as accurate as possible. This automated system is an intelligent task that saves a lot of time. To make, an intelligent system does such a task is challenging. This is why we work on accident detection using some automated techniques to solve such a challenge. We work on accident detection from a surveillance system which is very needful to the user who wants to monitor the events. Researchers from both academy and industries use artificial intelligence and image processing techniques to improve automated detection techniques, however, the scope of today's technology remains challenging to use them inside the world. Recently, deep learning methods have been extended to various computer vision activities such as scene classification, object detection, segmentation, action recognition. “Adaptive video-based algorithm for accident detection on highways”, illustrated the approach is based on the optical flow estimation and adaptive threshold heuristic calculation. Experimentation showed the reliability and practicability of the suggested algorithm using frames for modeling traffic motion. Looking at the salient features of the moving object, during this approach, an optimal summarization framework is proposed. This framework is tested at different stages of road accidents and has been tested for different kinds of collisions. present in "Vision-based real-time traffic accident detection”, It implements automated monitoring of traffic collisions in real-time. Purposed automatic detection of accidents in surveillance. That immediately learns to highlight representation and removes deep representation from the typical traffic videos using denoising autoencoders.

In the previous couple of years, object classification and detection capabilities have improved due to advances in deep learning and convolution networks. In “Going deeper with convolutions” presents a deep convolutional neural Inception that leads to the new techniques for classification and detection inside the ImageNet Large-Scale Visual Recognition Challenge. The most trademark of this design is that the moved forward utilization of the computing sources interior the organization.

we have identified some issues/limitations in the existing solutions to generate video summarization based on the accident event. In most of the solutions they are using handcrafted feature extraction techniques. To detect a particular event from a video like accident detection rather than choosing/deciding handcrafted features. We may use automated extraction techniques for the applications. A deep learning model offers automated feature extraction, and even deep learning is a new development and is often used for high-level vision tasks such as detection of accident scenes. So, we intend to use deep learning models to provide more positive outcomes for these problems.

Prediction of crash risk is vital for avoiding secondary crashes and safeguarding highway traffic. For many years, researchers have explored several techniques for early and precise detection of crashes to aid in traffic incident management. With recent advancements in data collection techniques, abundant real-time traffic data is available for use. Big data infrastructure and machine learning algorithms can utilize this data to provide suitable solutions for the highway traffic safety system. This real-world traffic data is used to design feature set for the deep learning models for crash detection and crash risk prediction.

Real-world traffic surveillance videos need continuous supervision to monitor and take appropriate actions in case of fatal accidents. However, continuously monitoring them with human supervision is error prone and tedious. Therefore, a deep learning approach for automatic detection and localization of road accidents has been proposed by formulating the problem as anomaly detection. The method follows one-class classification approach and applies spatiotemporal autoencoder and sequence-to-sequence long short-term memory autoencoder for modelling spatial and temporal representations in the video. The model is executed on a real-world video traffic surveillance datasets and significant results have been achieved both qualitatively and quantitatively.

The increase in number of vehicles on the road causes much burden on road traffic management personnel and authorities to handle challenges like road accidents, thus, requiring quick surveillance to mitigate the chances of the loss of lives and properties. Therefore, for detecting and avoiding the mishaps like accidents, cities are deployed with CCTV surveillance cameras for traffic monitoring purposes. Manually checking the surveillance videos in real time for monitoring the traffic and identifying the occurrence of any unwanted incidents by human personnel is not a feasible solution. Moreover, the videos are continuously streamed from CCTV cameras and some unusual activities may get missed by error-prone manual surveillance.

Highway work zones are most vulnerable roadway segments for congestion and traffic collisions. Hence, providing accurate and timely prediction of the severity of traffic collisions at work zones is vital to reduce the response time for emergency units (e.g., medical aid), accordingly improve traffic safety and reduce congestion. In predicting the severity of traffic collisions, previous studies used different statistical and machine learning models with accuracy as the main evaluating factors

Chapter 5
Proposed Solution

This chapter contains brief description about the proposed solution of the current working project. This section contains few drawings and graphical illustrations.

In a globalized world people are highly dependent on automobiles on a daily basis. There might be some billions of vehicles on the roads and due to recklessness of driving there are millions of casualties causing day by day around the world. The road crash injuries and the lack of immediate medical attention leads to deaths. So, to avoid too many casualties' different methodologies are implemented through technology. The existing system mainly deals with detecting the accidents and rescue the victims through

Collecting of dataset

a deep learning model is created to recognize the number plate using the dataset made by us. we used TensorFlow framework with the Kera's deep learning library. we collected 500, 550 images 75% of the images were used for training, 25% for testing and 5% for validation. Since the images were taken from the real time background, they carried out several image processing techniques like median blur smoothening, Adaptive Gaussian thresholding and morphological transformations. After these preparations, the CNN model is trained using the images. The image features extracted from CNN are applied to LSTM network followed by the decryption algorithm.

Labeling of images

Images are label using a labeler software where it is labeled to convert it into xml file. All the images are then divided into train and test data files.

Training of data

The first step is to install TensorFlow-GPU. The requirements for TensorFlow-GPU are

Anaconda, CUDA, and cuDNN. where, CUDA and cuDNN, are needed to utilize the Graphics Memory of the GPU and shift the workload. Meanwhile, Anaconda is what we will use to configure a virtual environment where we will install the necessary packages.

TensorFlow

TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.

Single shot detection (SSDs)

Image classification in computer vision takes an image and predicts the object in an image, while object detection not only predicts the object but also finds their location in terms of bounding boxes. Single shot detector is faster in speed and it's very high in accuracy for object detection.

SSD has two components: a backbone model and SSD head. Backbone model usually is a pre-trained image classification network as a feature extractor. This is typically a network like ResNet trained on ImageNet from which the final fully connected classification layer has been removed. We are thus left with a deep neural network that is able to extract semantic meaning from the input image while preserving the spatial structure of the image albeit at a lower resolution. We will explain what feature and feature map are later on. The SSD head is just one or more convolutional layers added to this backbone and the outputs are interpreted as the bounding boxes and classes of objects in the spatial location of the final layers activations.

Working of single shot detection

Image classification in computer vision takes an image and predicts the object in an image, while object detection not only predicts the object but also finds their location in terms of bounding boxes. For example, when we build a swimming pool classifier, we take an input image and predict whether it contains a pool, while an object detection model would also tell us the location of the pool.

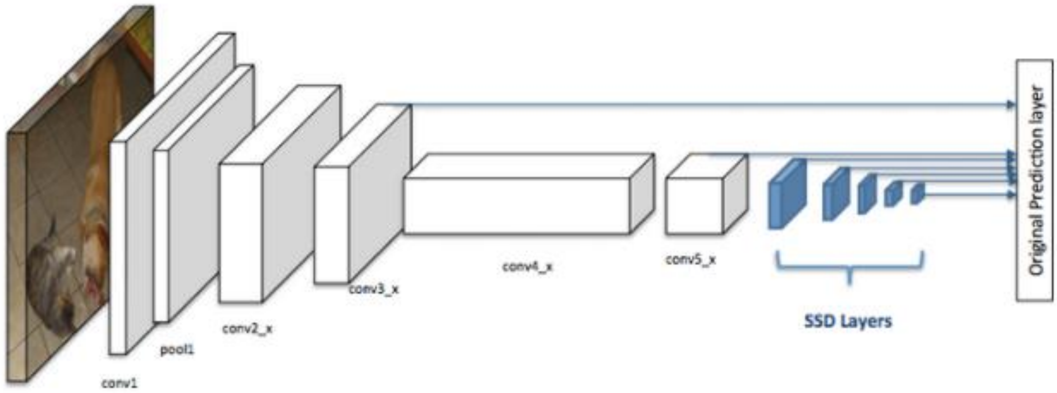


Fig 5.1 Architecture of a convolutional neural network with a SSD detector

GRID CELL:

SSD divides the image using a grid and have each grid cell be responsible for detecting objects in that region of the image. Detection objects simply means predicting the class and location of an object within that region. If no object is present, we consider it as the background class and the location is ignored.

ANCHOR BOX:

Each grid cell in SSD can be assigned with multiple anchor/prior boxes. These anchor boxes are pre-defined and each one is responsible for a size and shape within a grid cell. SSD uses a matching phase while training, to match the appropriate anchor box with the bounding boxes of each ground truth object within an image. Essentially, the anchor box with the highest degree of overlap with an object is responsible for predicting that object's class and its location. This property is used for training the network and for predicting the detected objects and their locations once the network has been trained. In practice, each anchor box is specified by an aspect ratio and a zoom level

ASPECT RATIO:

Not all objects are square in shape. Some are longer and some are wider, by varying degrees. The SSD architecture allows pre-defined aspect ratios of the anchor boxes to account for this. The ratios parameter can be used to specify the different aspect ratios of the anchor boxes associates with each grid cell at each zoom/scale level.

ZOOM LEVEL:

It is not necessary for the anchor boxes to have the same size as the grid cell. We might be interested in finding smaller or larger objects within a grid cell. The zooms parameter is used to specify how much the anchor boxes need to be scaled up or down with respect to each grid cell.

System	VOC2007 test *mAP*	FPS (Titan X)	Number of Boxes	Input resolution
Faster R-CNN (VGG16)	73.2	7	~6000	~1000 x 600
YOLO (customized)	63.4	45	98	448 x 448
SSD300* (VGG16)	77.2	46	8732	300 x 300
SSD512* (VGG16)	**79.8**	19	24564	512 x 512

Table 5.1 YOLO VS SSD

SSD speeds up the process by eliminating the need for the region proposal network. To recover the drop in accuracy, SSD applies a few improvements including multi-scale features and default boxes. These improvements allow SSD to match the Faster R-CNN's accuracy using lower resolution images, which further pushes the speed higher. According to the following comparison, it achieves the real-time processing speed and even beats the accuracy of the Faster R-CNN. the SSD model detects objects in a single pass, which means it saves a lot of time. But at the same time, the SSD model also seems to have amazing accuracy in its detection.

In order to achieve high detection accuracy, the SSD model produces predictions at different scales from the feature maps of different scales and explicitly separates predictions by aspect ratio.

YOLO VS SSD:

The yolo model is a predecessor to the SSD model, it also detects

images in a single pass, but it uses two fully connected layers while the SSD uses multiple convolutional layers. The SSD model adds several feature layers to the end of a base network, which predicts the offsets to default boxes of different scales and aspect ratios and their associated scores.

The SSD produces an average of 8732 detections per class while the YOLO produces only 98 predictions per class.

PERFORMANCE OF SSD:

The SSD model is proven to show better results than the previous state-of-the-art detection algorithms like YOLO and Faster R-CNN. The multi-output layers at different resolutions have impacted the performance hugely, in fact, even removal of few layers resulted in a decrease in the accuracy by 12%.The SSD model is one of the fastest and efficient object detection models for multiple categories. And it has also opened new doors in the domain of object detection.

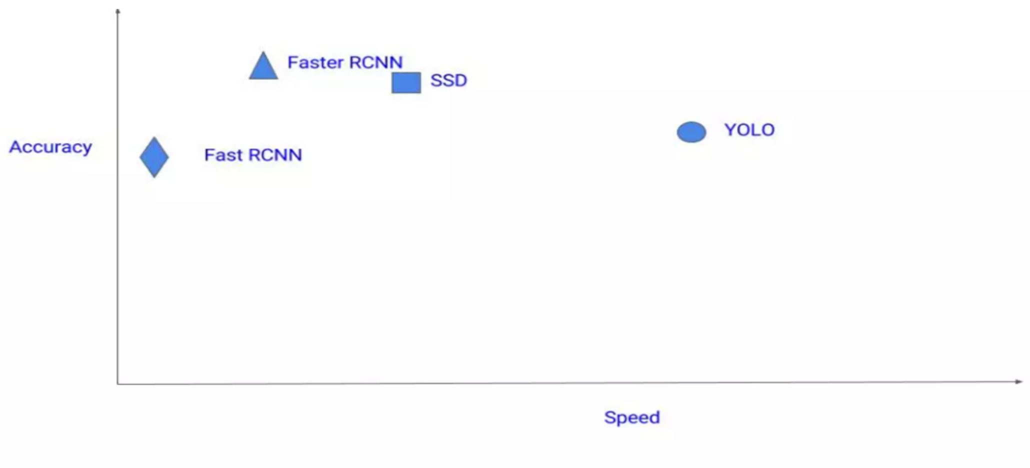


Fig 5.2 CompAlgorithm Accuracy

NUMBER PLATE DETECTION:

Open cv:(Open-Source Computer Vision Library) is an open-source computer vision and machine learning software library. It mainly focuses on image processing, video capture and analysis, including features like face detection and object detection, and it helps to provide a common infrastructure for computer vision applications.

Hardcascade

Besides installing the OpenCV library, another important thing to retrieve is the **Haar Cascade** XML file It is a machine learning based approach where a cascade function is trained from many positive and negative images. It extracts numerical values for features (e.g. edges, lines) efficiently with the concept of integral image (or summed-area table)

Number plate detection is the step where the number plate from the larger scene is bound. The location of the number plate is identified and the output will be a sub image contains only the number plate. The dataset consists of 1000 images of number plates and it is split into training and testing. For training, 800 images are taken and annotated using Labellmg similar to the process done in vehicle detection. After training, the testing is done. After that detection is done. All the detected number plates are stored in separate folder for Character Recognition.

Fig 5.3 number plate extraction using hard-cascade file

Character recognition

For character recognition we are using keras-ocr to recognize the character from the extracted number plate and store it in data base

What is Keras-OCR ?

Keras is an open-source software library that provides a Python interface for artificial neural networks. Keras acts as an interface for the TensorFlow library.

Difference between keras-ocr and pytessaract

OCR Prediction is not only dependent on the model and also on a lot of other factors like clarity, greyscale of the image, hyperparameter, weightage given, etc.Tesseract is performing well for high-resolution images. Certain morphological operations such as dilation, can help increase pytesseract performance.

Keras-OCR is image specific OCR tool. If text is inside the image and their fonts and colors are unorganized, Keras-ocr gives good results.

	Actual Value	Tesseract Prediction	Keras-OCR Prediction
Number Plate High Quality	HR26DK8337	HR260K8337	HR26DK8337
Number Plate Low Quality	MH14GN9239	Spaces	MHL4GH9239
Handwritten Low Quality	AMIT ASHISH	Spaces	ADIT ASHISH
Handwritten High Quality	LAKSHMINIVAS TOURIST HOME	LAKSHMINIVAS TOURIST HOME	LAKSHMINIVAS TOURIST HOI
Image with text High Quality	Albert Einstein	Albert Einstein	Albert Einstein
Image with text Low Quality	Kotak Mahindra Bank	Kotak Mahindra Bank	Kotak Mahindra Bank
Reciept High Quality	Order #19866	Order #19866	Order #119666
Reciept Low Quality	Amoxicillin 500mg	Spaces	Amoxicillin 500mg

Table5.2 OCR accuracy comparison

How Keras-OCR work

Keras-OCR is a Optical Character Recognition Optical Character Recognition (OCR) is the conversion of images of handwritten or printed text into a machine text. There are several OCR engines. This system uses Keras OCR - OCR . This can be downloaded in Anaconda using git. The engine path must be specified and added. The segmented characters are given as input to OCR. The OCR will recognize those characters. The extracted data is stored in a terminal

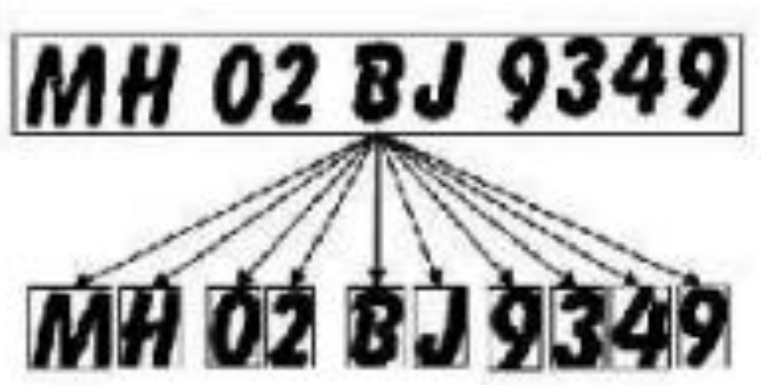


Fig5.4 OCR functioning

Sending Alert to Trustee:

Simple Mail Transfer Protocol (SMTP)

Simple Mail Transfer Protocol (SMTP) is a protocol, which handles sending e-mail and routing e-mail between mail servers.

Python provides **smtplib** module, which defines an SMTP client session object that can be used to send mail to any Internet machine with an SMTP or ESMTP listener daemon.

Here is a simple syntax to create one SMTP object, which can later be used to send an e-mail –

CHAPTER 6

SYSTEM REQUIREMENTS AND SYSTEM DESIGN

System requirement is a requirement at the system level that describes a function or the functions which the system as a whole should fulfill to satisfy the stakeholder needs and requirements. System requirements are expressed in an appropriate combination of textual statements, views, and non-functional requirements. System requirements express the levels of safety, security, reliability which will be necessary.

System requirements is a statement that identifies the functionality that is needed by a system in order to satisfy the customer’s requirements. System requirements are a broad and also narrow subject that could be implemented to many items. Whether discussing the system requirements for certain computers, software, or the business processes from a broad view point. Also, taking it down to the exact hardware or coding that runs the software. System requirements are the most effective way of meeting the user needs and reducing the cost of implementation. System requirements could cause a company to save a lot of money and time, and also can cause a company to waste money and time. They are the first and foremost important part of any project, because if the system requirements are not fulfilled, then the project is not complete.

System requirements describe what the system shall do whereas the user requirements (user needs) describe what the user does with the system. System requirements are classified as either functional or non-functional requirements in terms of functionality feature of the requirement.

Functional Requirements:

1 Collection: Collecting the data required to detect an intrusion attack from the cloud

2 Preprocessing: Perform data cleaning and removing noisy data from the data

3 Feature Extraction and Dimensionality Reduction: Extracting features which are important for prediction using PCA thus reducing the

4 dimensionality of the dataset.

5 Training: Training the machine with clustering and classification algorithms

6 Predict: Upload the data to the machine learning algorithms and predict the result

Non-Functional Requirements:

Usability: The system is designed as an automated process hence there is not much user intervention

Performance: The system is developed with high level languages and uses algorithms of the best accuracy

Reliability: The coding language used to develop the system is very reliable

Readability: The code is written in python which makes it easier to read and understand.

Scalability: The system is designed to work for data of any size and thus has the ability to handle increasing loads

Robustness: The system identifies erroneous or invalid data input with the help of standardization algorithms

Hardware Requirements

Selection of hardware also plays an important role in existence and performance of any software.

The size and capacity are main requirements.

1.**processo**r intel i5 & above

2.**RAM**: 8 GB/16 GB

Software Requirements

The software requirements specification is produced at the end of the analysis task. Software

Requirements is a difficult task, for developing the application.

1.Operating System: Windows 10

2.Coding language: Python 3.7.4

3.**IDE**: Google Collab

4 KERAS_OCR

SYSTEM DESIGN

System design is the process of designing the elements of a system such as the architecture, modules and components, the different interfaces of those components and the data that goes through that system.

The purpose of the System Design process is to provide sufficient detailed data and information about the system and its system elements to enable the implementation consistent with architectural entities as defined in models and views of the system architecture.

Elements of a System

- **Architecture -** This is the conceptual model that defines the structure, behavior and more views of a system. We can use flowcharts to represent and illustrate the architecture.

- **Modules -** This are components that handle one specific tasks in a system. A combination of the modules make up the system.

- **Components -** This provides a particular function or group of related functions. They are made up of modules.

- **Interfaces -** This is the shared boundary across which the components of a the system exchange information and relate.

- **Data -** This the management of the information and data flow

CHAPTER 7
UML DIAGRAMS

USE CASE DIAGRAM

From the use case diagram we can observe that there are five use cases the first one is "input" followed by "detect accident", "number plate detection", "number plate recognition", "system alert". In the input the user provides frames, and then in second attribute it detect accident and checks whether the accident is occurred or not if there's any accident detected then the number plate detection detects the number plate if accident occurred**.** And further the characters from the number plate will be extracted by number plate recognition. And system alert notifies the victim's trustee's about the accident with location and time.

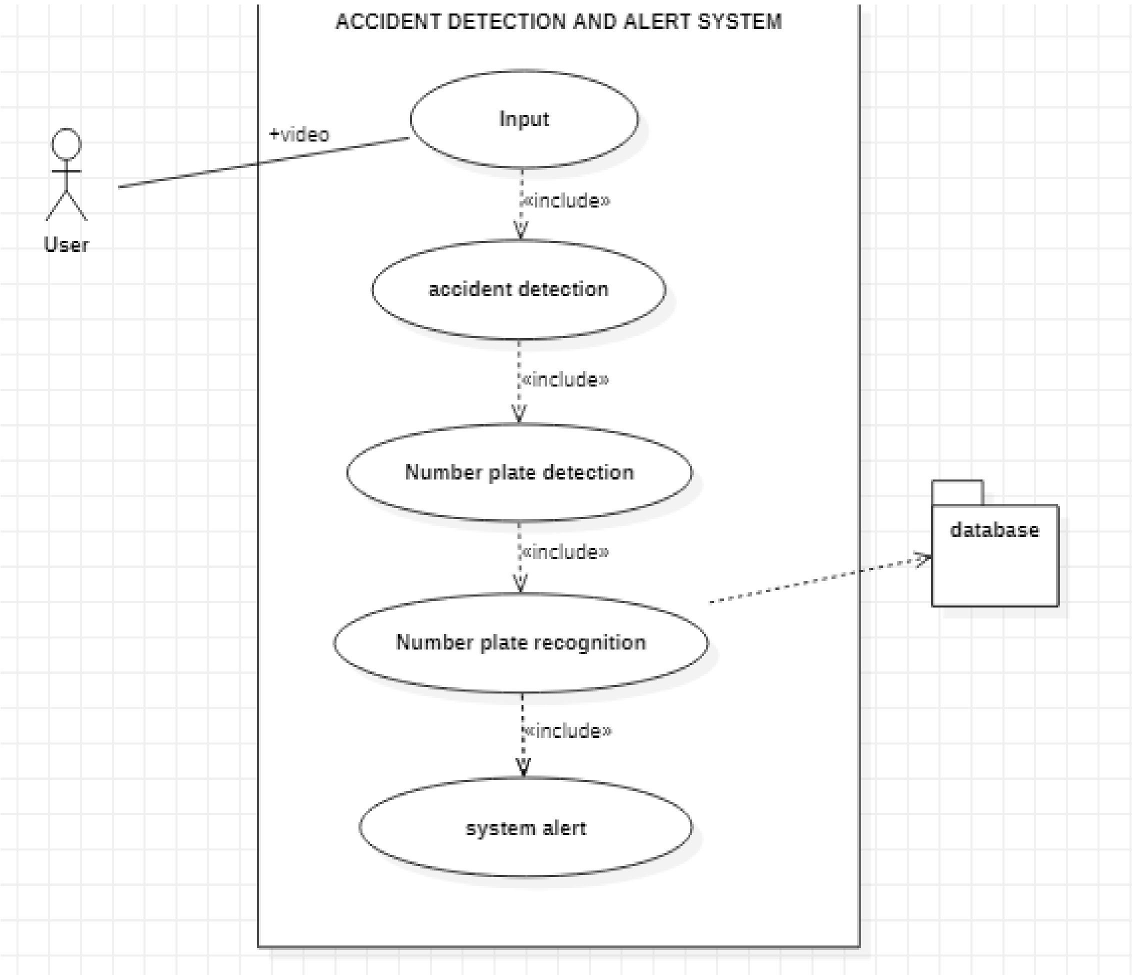


Fig7.1 use case diagram for accident detection and alert system

CLASS DIAGRAM

A class diagram is an illustration of the relationships and source code dependencies among classes in the Unified Modeling Language (UML). In this context, a class defines the methods and variables in an object, which is a specific entity in a program or the unit of code representing that entity. Class diagrams are useful in all forms of object-oriented programming (OOP).

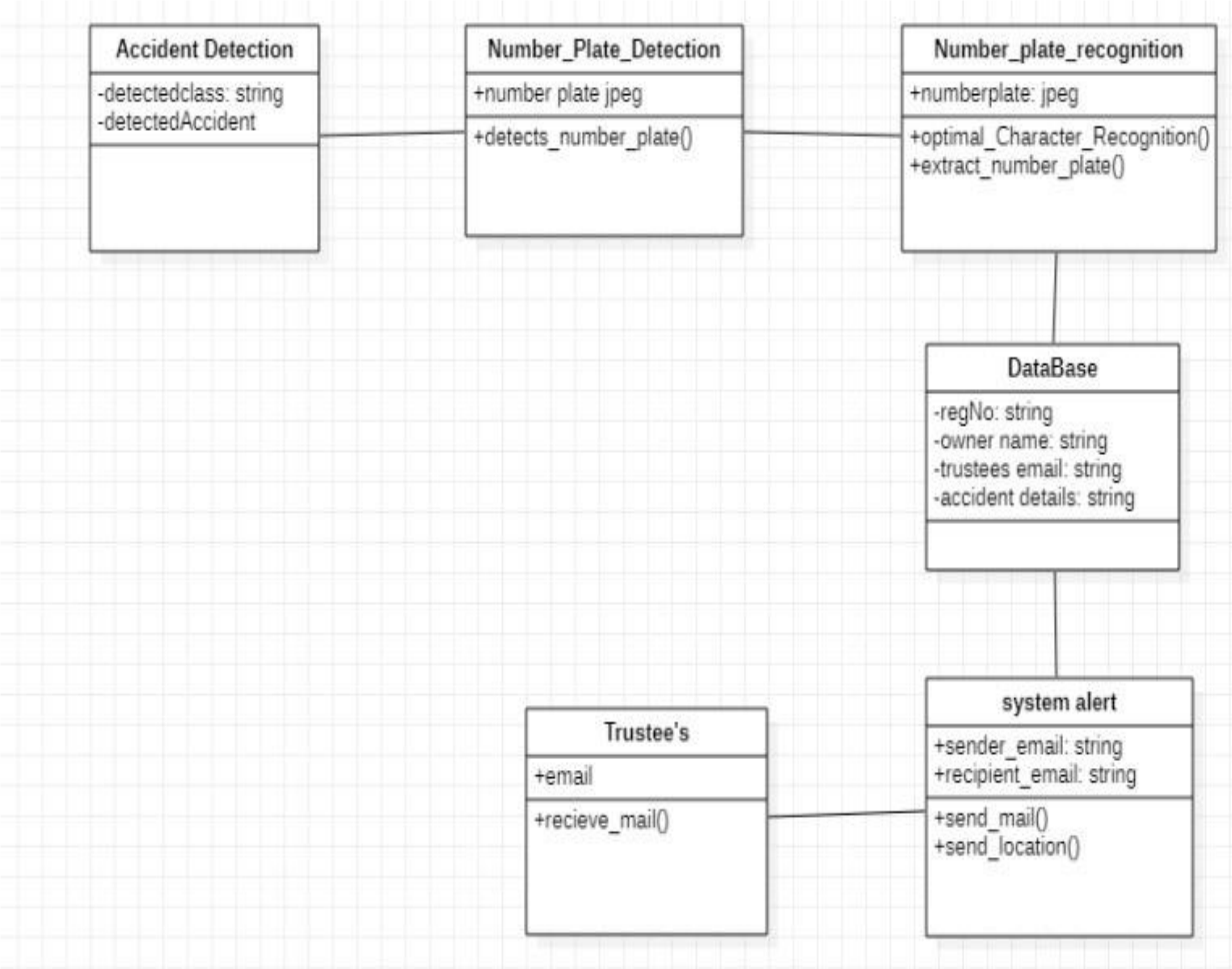


Fig7.2 Class diagram for accident detection and alert system

SEQUENCE DIAGRAM

Sequence Diagrams are interaction diagrams that detail how operations are carried out. They capture the interaction between objects in the context of collaboration. Sequence diagram are time focus and they show the order of the interaction visually by using the vertical axis of the diagram to represent time what messages are sent and when. Sequence diagram are time focus and they show the order of the interaction they not only have interaction but also some focus of control over the sequences. And also has time line to show from which part it is sending and which part is receiving.

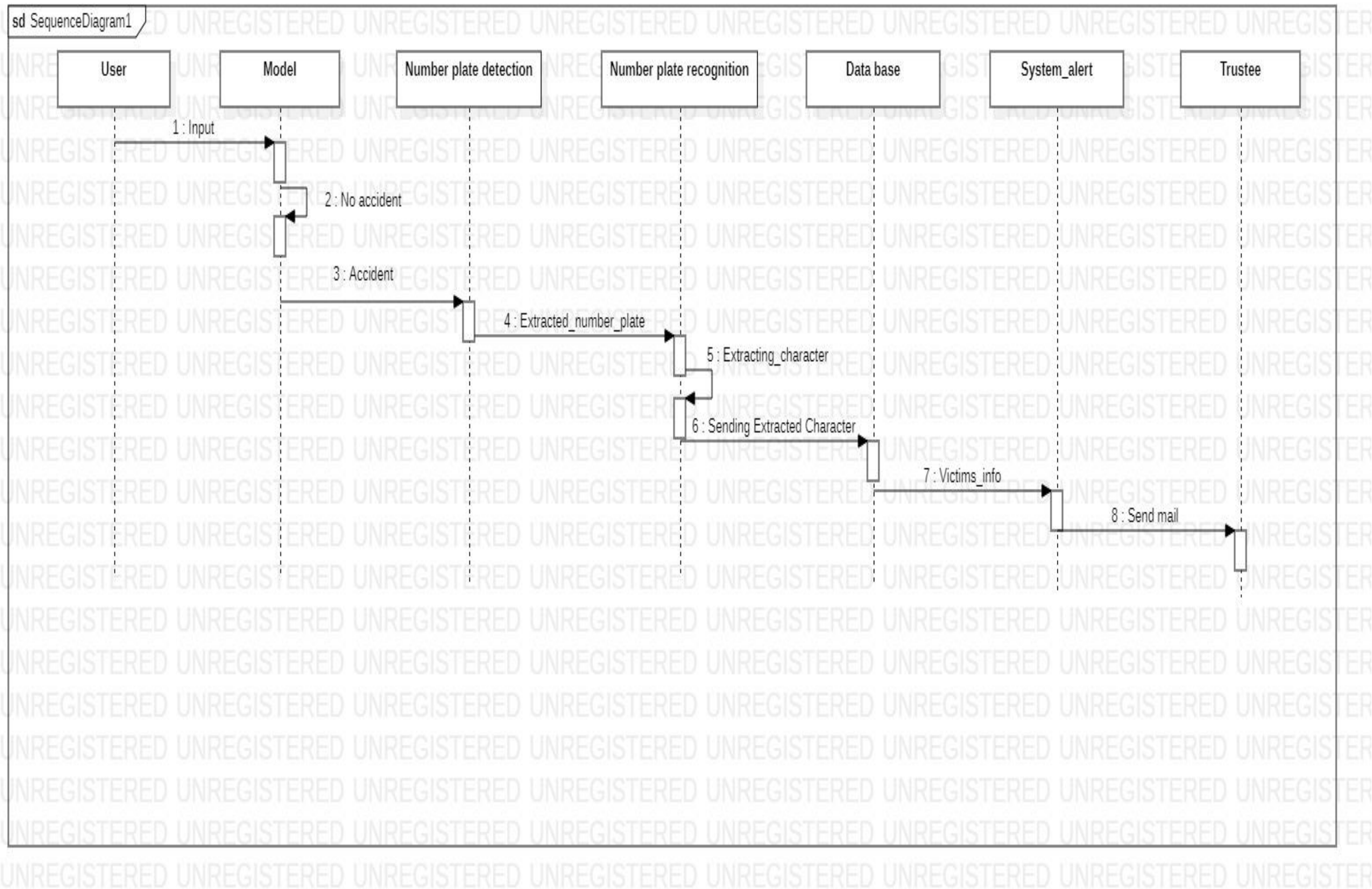


Fig 7.3 Sequence diagram for accident detection and alert system

In this sequence diagram for accident detection the user provides input in the form of frames to the model and the developed model checks whether an accident has occurred or not.

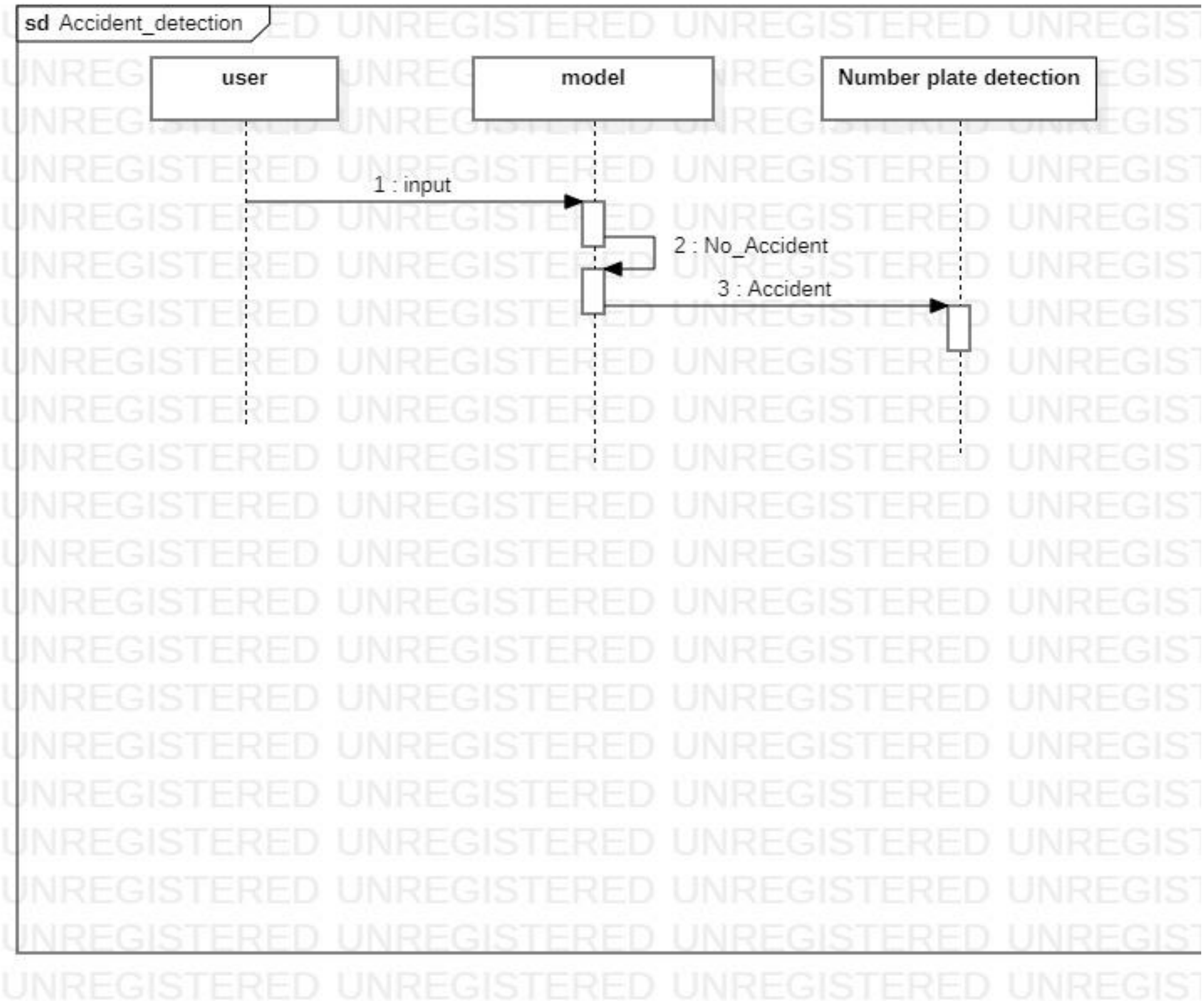


Fig 7.4 Sequence diagram for accident detection

in sequence diagram for number plate detection if the model has not detected any accident then it continues to search for more frames and once the accident detected then the number plate of the vehicle which met with the accident will be detected and soon after the data from the number plate will be recognized

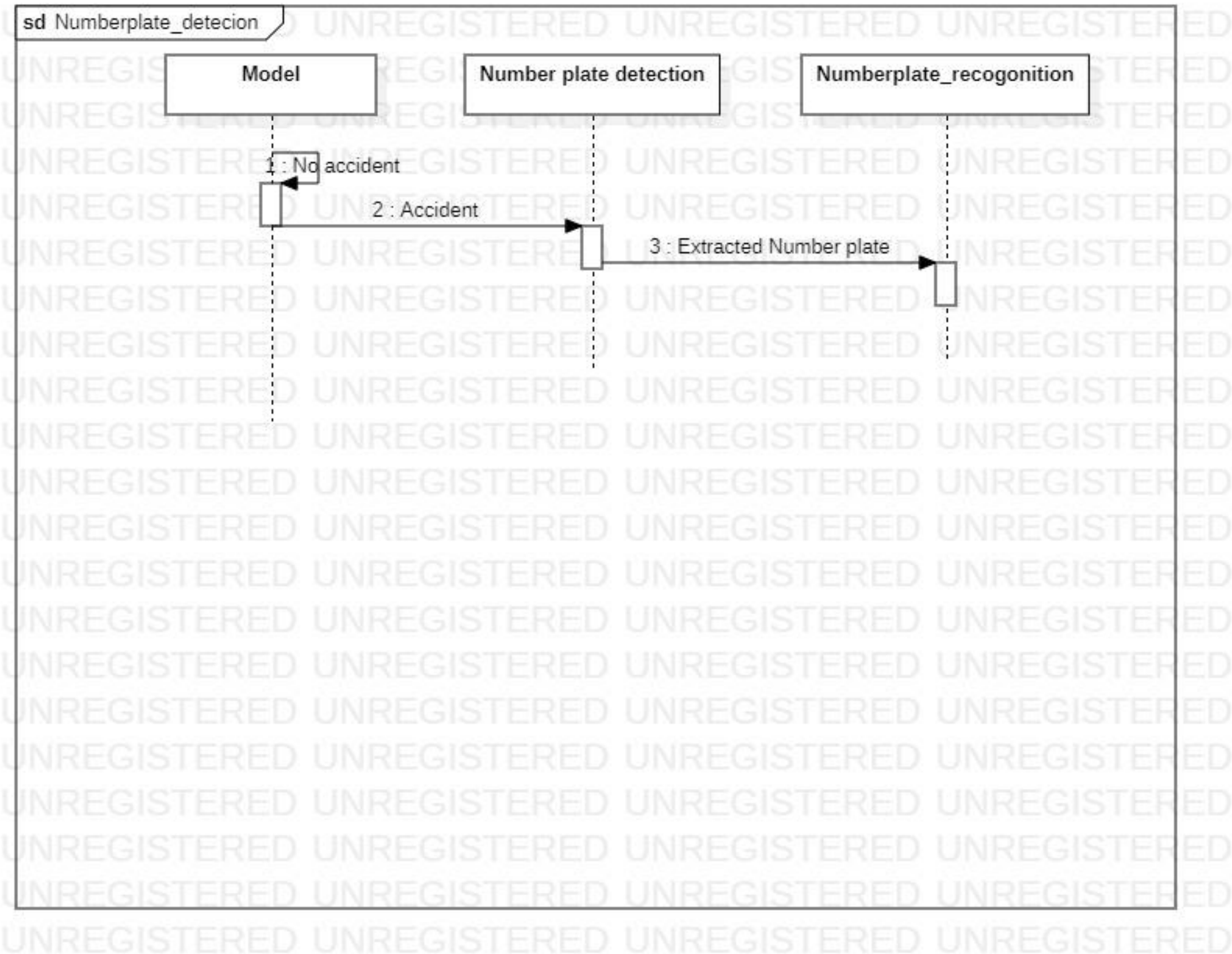


Fig 7.5 Sequence diagram for Numberplate detection

In sequence diagram for number plate recognition and this depicts about different process flow. From, the number plate detection model the number plate is extracted and loop will be continued until each and every character from the number plate is read using keras-OCR. And the data is stored in data base

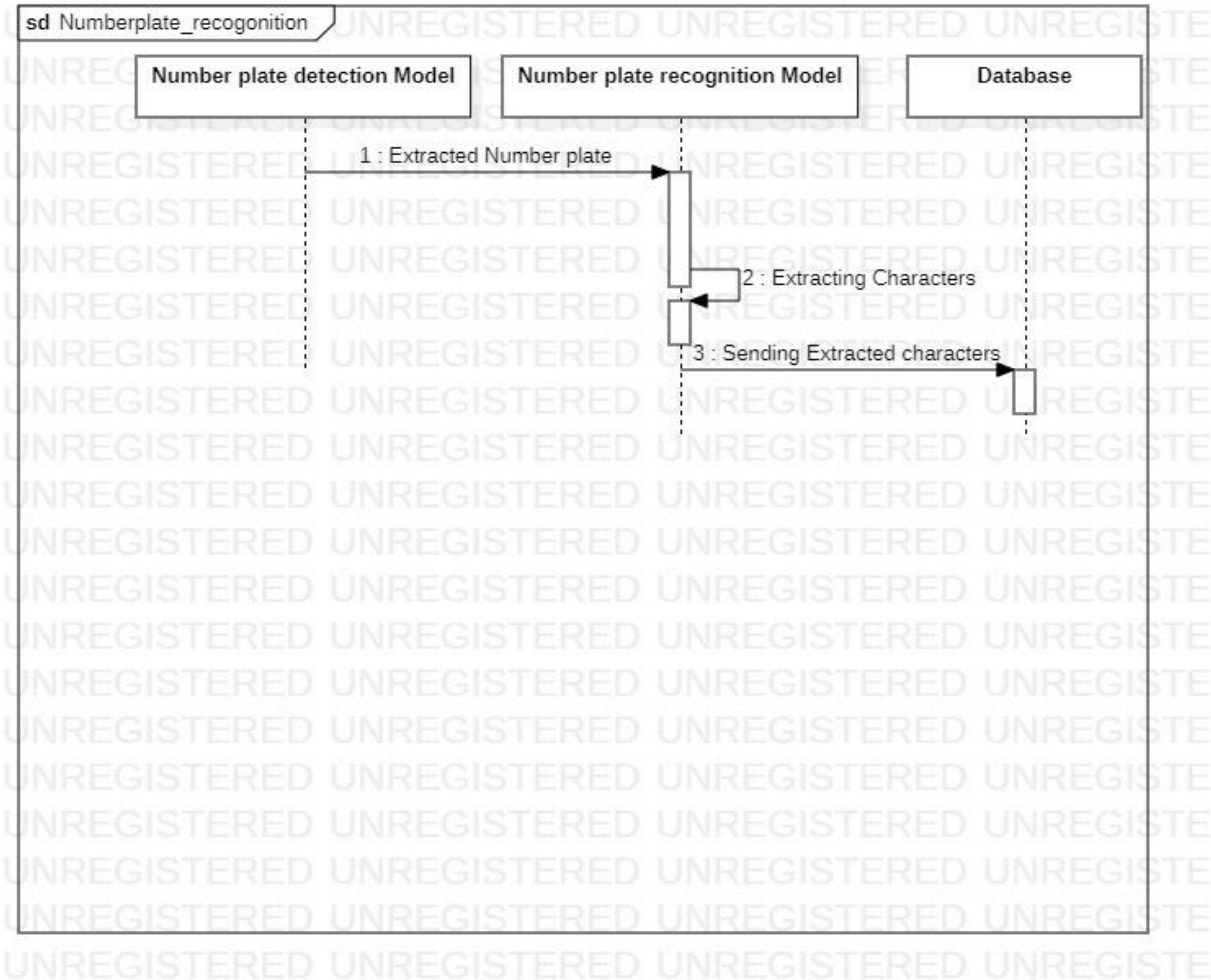


Fig 7.6 sequence diagram for Numberplate recognition

In sequence diagram for alert system after successfully fetching the corresponding details of the victim the system alert sends the details of the victim to their trustee's using SMTP library

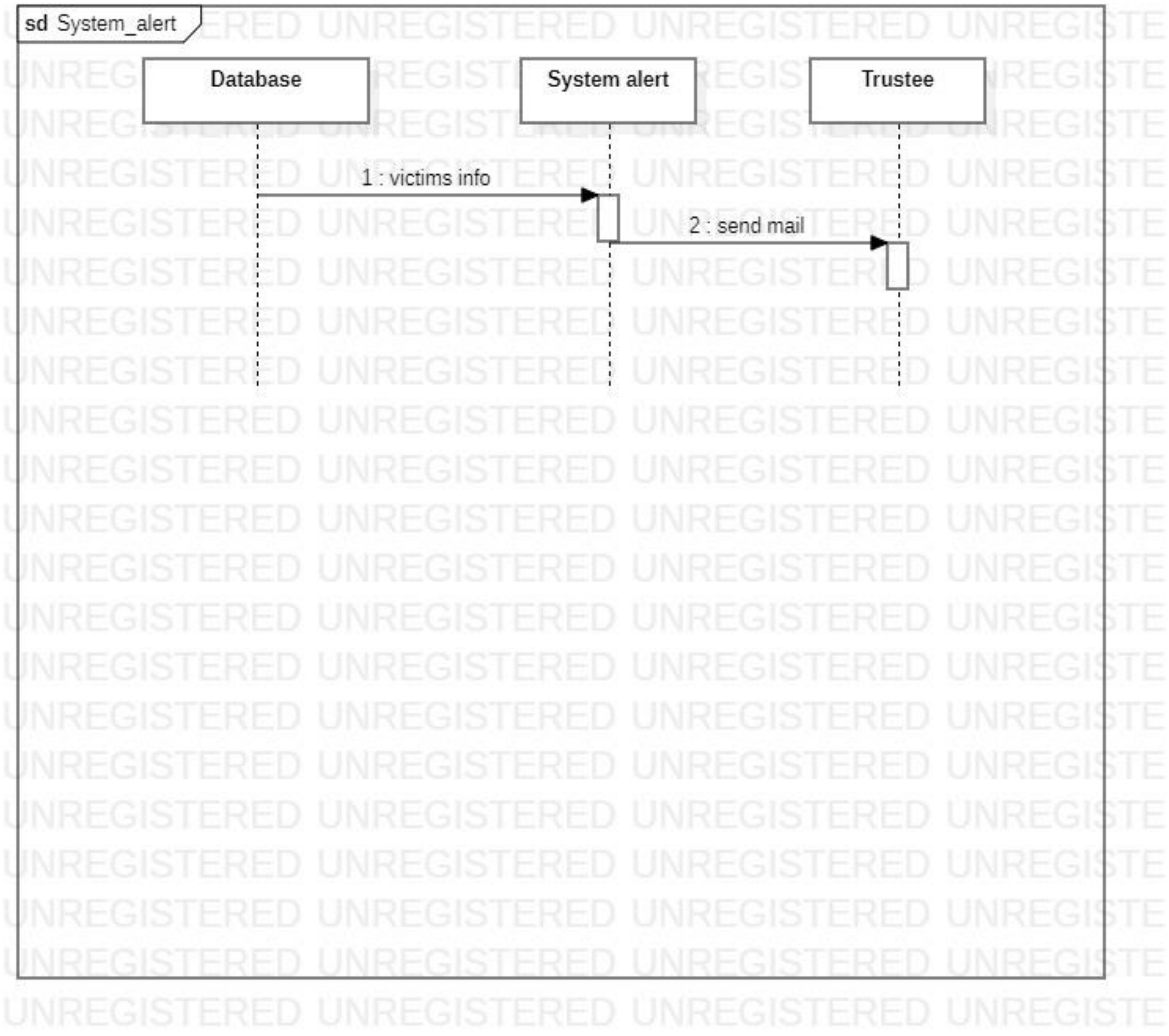


Fig7.7 Sequence diagram for Alert system

ACTIVITY DIAGRAM

In Activity Diagram we can understand that the user is providing videos or frames into the Application or into UI which is developed. And after providing certain data into the application the algorithm checks whether an accident is occurred or not. If detected, then the number plate will be detected and after the number plate is successfully detected the numbers will be extracted. And further the corresponding details of the number plate will be fetched from the database and notifies the trustee's

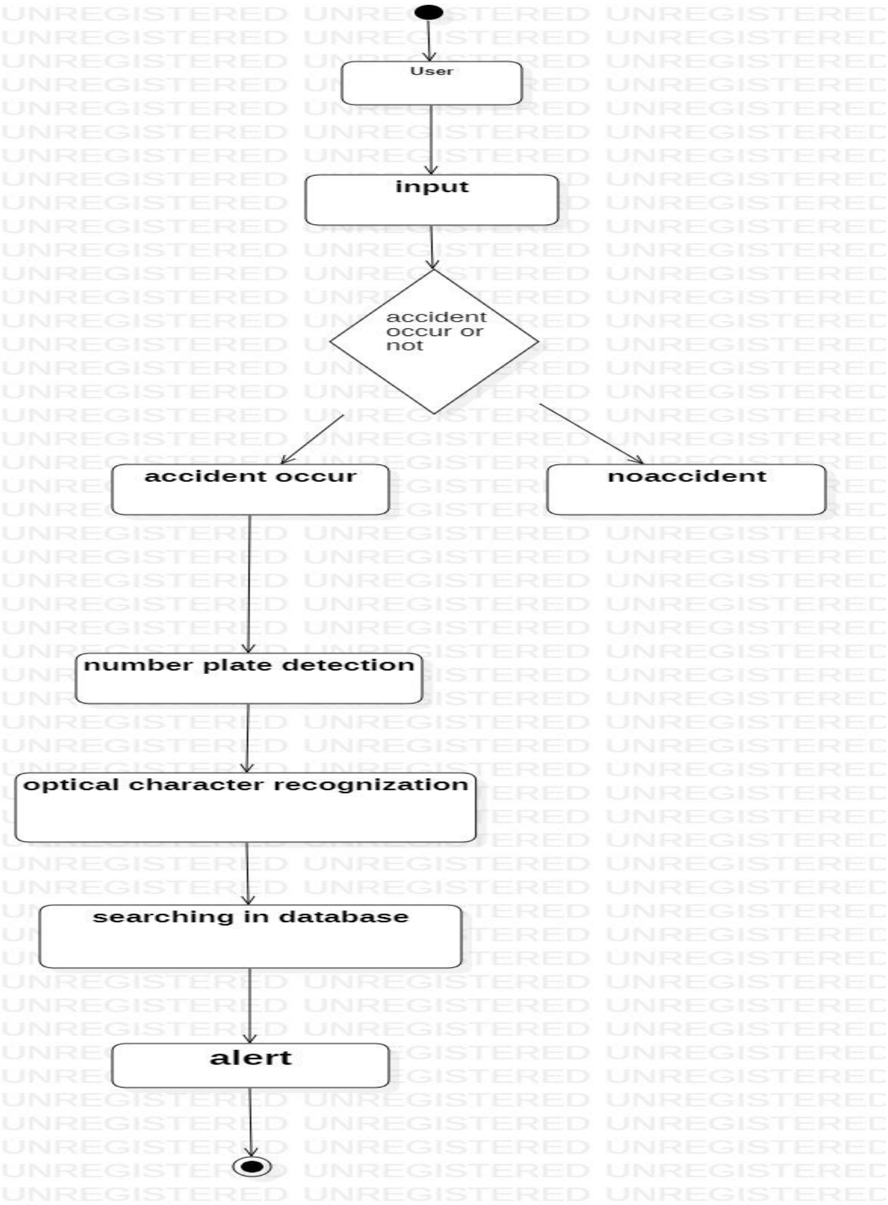


Fig 7.8 Activity diagram for accident detection and alert system

COMPONENT DIAGRAM

The component diagram is essentially a class diagram that focuses on system components and in this case CCTV, number plate , number plate recognition, and system alert, data base .where data moves from CCTV to numberplate to numberplate recognition and system alert, were from the database the data move to a number plate recognition.

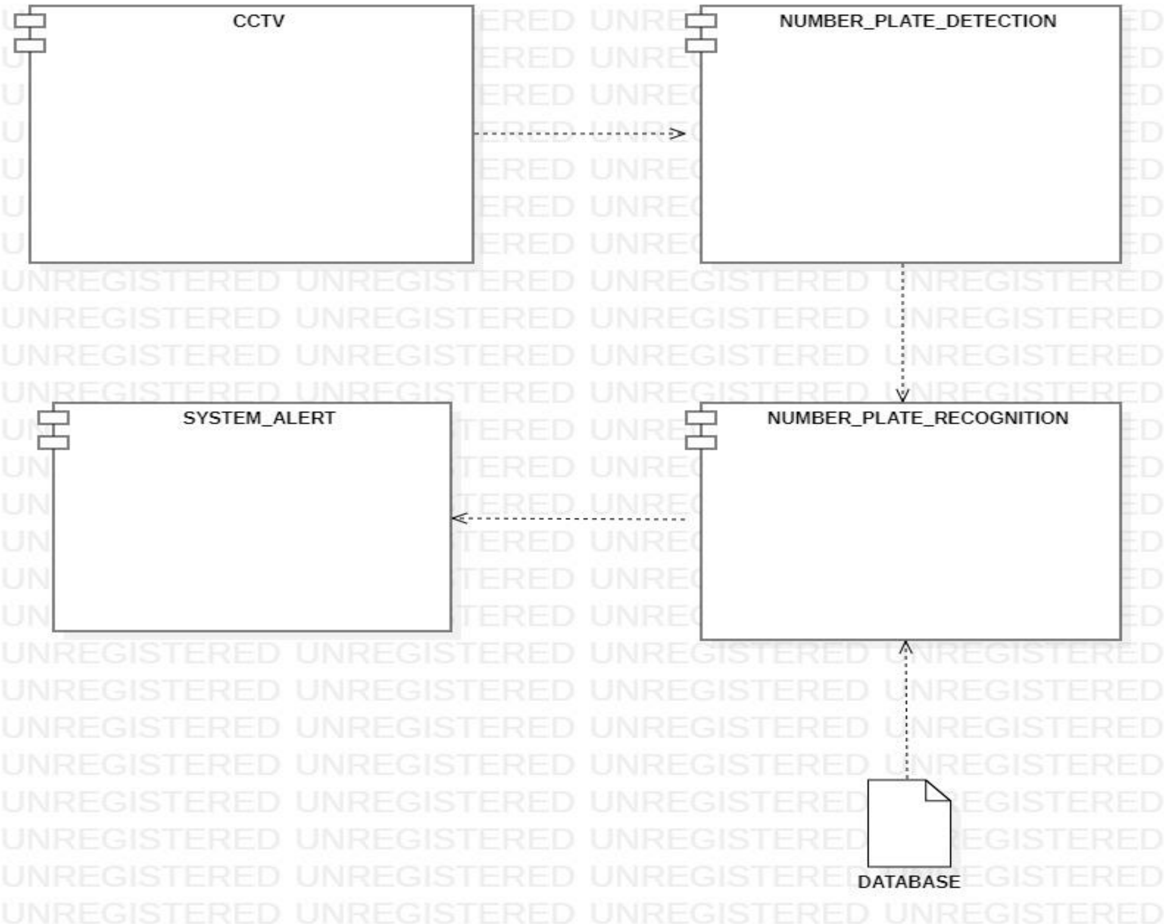


Fig 7.9 component diagram for accident detection and alert system

COLLABORATION DIAGRAM

The below collaboration diagram shows the interaction between the objects. The straight link between the two objects and arrows represents the call and return value between them. In the figure the data is being processed from the input and later detects whether the accident is occurred or not. And following the number plate will be detected and further the characters are recognized from the number plate through OCR optimal character recognition. Then the required details is being fetched from the database and system alert sends or notifies the victims trustees

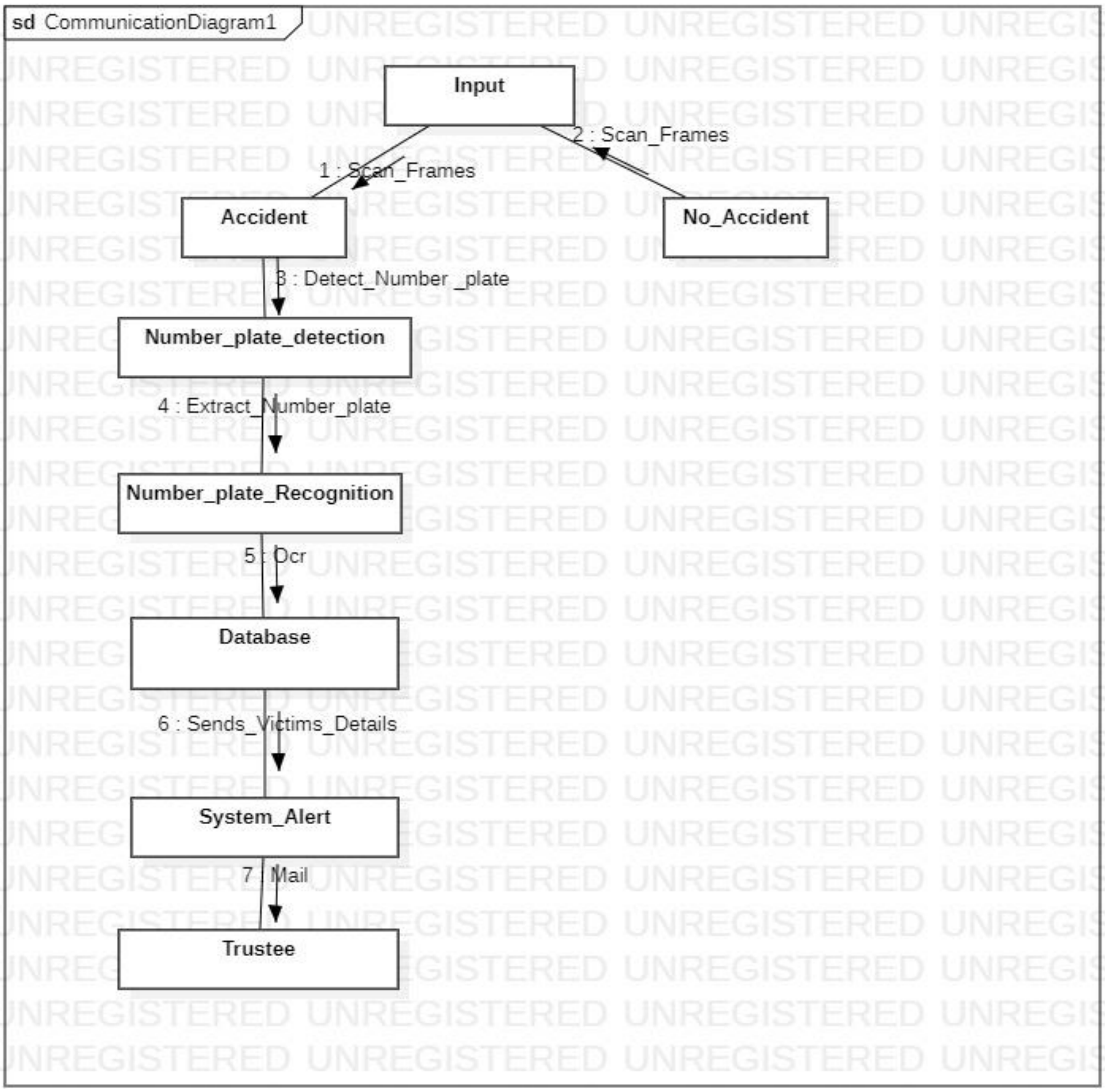


Fig7.10 collaboration diagram for accident detection and alert system

CHAPTER 8
CODING

Setup.py

```
import os
os.environ['TF_CPP_MIN_LOG_LEVEL'] = '2'
import pathlib
import tensorflow as tf
import cv2
import argparse
import time
from object_detection.utils import label_map_util
from object_detection.utils import visualization_utils as viz_utils
import numpy as np
from PIL import Image
import matplotlib.pyplot as plt
import warnings
import pymongo
import matplotlib.pyplot as plt
import keras_ocr
from datetime import datetime
import smtplib
import json
myclient = pymongo.MongoClient("mongodb://localhost:27017/")
camerano="camera_01"
def detac():
  warnings.filterwarnings('ignore')   # Suppress Matplotlib warnings
  tf.get_logger().setLevel('ERROR')
  gpus = tf.config.experimental.list_physical_devices('GPU')
  for gpu in gpus:
      tf.config.experimental.set_memory_growth(gpu, True)
  IMAGE_PATHS = 'images/4 .jpg'
  PATH_TO_MODEL_DIR = 'model/exported-models'
  PATH_TO_LABELS = 'model/exported-models/saved_model/label_map.pbtxt'
  MIN_CONF_THRESH = 0.60
  PATH_TO_SAVED_MODEL = PATH_TO_MODEL_DIR + "/saved_model"
  print('Loading model...', end='')
  start_time = time.time()
  detect_fn = tf.saved_model.load(PATH_TO_SAVED_MODEL)
  end_time = time.time()
  elapsed_time = end_time - start_time
  print('Done! Took {} seconds'.format(elapsed_time))
  category_index =
label_map_util.create_category_index_from_labelmap(PATH_TO_LABELS,
                                                    use_display_name=True)
  def load_image_into_numpy_array(path):

      return np.array(Image.open(path))
  print('Running inference for {}... '.format(IMAGE_PATHS), end='')
```

```
  image = cv2.imread(IMAGE_PATHS)
  image_rgb = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
  image_expanded = np.expand_dims(image_rgb, axis=0)
  input_tensor = tf.convert_to_tensor(image)
  input_tensor = input_tensor[tf.newaxis, ...]
  detections = detect_fn(input_tensor)
  num_detections = int(detections.pop('num_detections'))
  detections = {key: value[0, :num_detections].numpy()
                for key, value in detections.items()}
  detections['num_detections'] = num_detections
  detections['detection_classes'] = detections['detection_classes'].astype(np.int64)
  image_with_detections = image.copy()
  label, _=viz_utils.visualize_boxes_and_labels_on_image_array(
        image_with_detections,
        detections['detection_boxes'],
        detections['detection_classes'],
        detections['detection_scores'],
        category_index,
        use_normalized_coordinates=True,
        max_boxes_to_draw=200,
        min_score_thresh=MIN_CONF_THRESH,
        agnostic_mode=False)
  # print(label)
  print('Done')
  cv2.imshow('Object Detector', image_with_detections)
  cv2.waitKey(0)
  cv2.destroyAllWindows()
  return label

def numdet():
  frameWidth = 640    #Frame Width
  franeHeight = 480   # Frame Height
  plateCascade = cv2.CascadeClassifier("haarcascade_russian_plate_number.xml")
  minArea = 500
  path = 'images/4.jpg'
  count = 0
  img  = cv2.imread(path)
  imgGray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
  numberPlates = plateCascade .detectMultiScale(imgGray, 1.1, 4)
  for (x, y, w, h) in numberPlates:
      area = w*h
      if area > minArea:
          cv2.rectangle(img, (x, y), (x + w, y + h), (255, 0, 0), 2)
          cv2.putText(img,"NumberPlate",(x,y-
5),cv2.FONT_HERSHEY_COMPLEX,1,(0,0,255),2)
          imgRoi = img[y:y+h,x:x+w]
```

```
        # cv2.imshow("ROI",imgRoi)
  # cv2.imshow("Result",img)
  # if cv2.waitKey(1) & 0xFF ==ord('s'):
  cv2.imwrite("numberplate/images"+str(count)+".jpg",imgRoi)
def extract():
  pipeline = keras_ocr.pipeline.Pipeline()
  images = [
    keras_ocr.tools.read(img) for img in [
        'numberplate/images0.jpg'
    ]
  ]
  prediction_groups = pipeline.recognize(images)
  stri=str(prediction_groups)
  print(stri[4:13]) # if ap09a2132 then it is [4:13], elseif ap09ae2132 change this line to
[4:14] fix this by using filtering i.e removing badchars
  plate_num=stri[4:13] #difference is firs tcase it is a in second one it is ae
  return plate_num
def getdet(regnum):
  mydb = myclient["mydb"]
  mycol = mydb["details"]
  stri=str(regnum)
  i=0
  for x in mycol.find({"regno": stri},{ "_id": 0,"regno": 1, "name": 1, "email":1 }):
     result=json.dumps(x)
  res = json.loads( result)
  name=res["name"]
  email=res["email"]
  print("Details of "+ regnum)
  print(name,email)
  return(name,email)
def putdet(regnum):
  mydb = myclient["mydb"]
  mycol = mydb["matter"]
  matter={"accident report vehicle":regnum}
  mycol.insert_one(matter)
def getcamdet(camerano):
  mydb = myclient["mydb"]
  mycol = mydb["camdetails"]
  cam=str(camerano)
  i=0
  for x in mycol.find({"camerano":cam},{ "_id": 0,"camerano": 1, "location": 1 }):
      result=json.dumps(x)
      res = json.loads(result)
      return res["location"]

def mail(name,email):
```

```
  now = datetime.now()
  time=str(now.strftime("%I:%M %p"))
  print(camerano)
  location=getcamdet(camerano)
  content = '\nHi there, your friend '+name+' has met with an accident at  '+time +', at loaction: '+location+"."
  username = "18b61a05d6@nmrec.edu.in"
  password = "nmrec123"
  sender = "ADRS"
  recipient = str(email)
  mail = smtplib.SMTP("smtp.gmail.com",587)
  mail.ehlo()
  mail.starttls()
  mail.ehlo()
  mail.login(username,password)
  header = 'To:' + recipient + '\n' + 'From:' + sender + '\n' + 'Subject: Accident Report \n'
  content = header+content
  mail.sendmail(sender,recipient,content)
  mail.close

detector=detac()
print(detector)
if(detector=='accident'):
  numdet()
  number=extract()
  print(number)
  putdet(number)
  name,email=getdet(number)
  try:
    print("Sending mail...")
    mail(name,email)
    print("Email sent to trustee successfully")
  except:
    print("Unable to send mail")
else:
  print("no accident has been detected")
```

To add vehicle details in database

```
import pymongo

myclient = pymongo.MongoClient("mongodb://localhost:27017/")

mydb = myclient["mydb"]

mycol = mydb["camdetails"]

print("please enter details to be stored into database")

while True:

    print("Enter Camera number")

    number=input()

    print("Enter location of {} ".format(number))

    name=input()

    details={"camerano":number,"location":name}

    mycol.insert_one(details)

    a=input("Press Enter to continue adding \n Press ctrl+z to exit")
```

CHAPTER 9

RESULT AND DISCUSSION

User interface was created for the user to upload the image, the uploaded data is integrated with algorithms. The result is displayed on application in form of image.

Fig 8.1 user interface

once the image is selected then execute button is pressed and rest of work is handled by system automatically

when the image is selected from the application then this model scans the image and look whether the accident occurred or not. If accident detected then model looks for the number plate of the vehicle this is done with the help of SSD algorithm

Why SSD algorithm

The yolo model is a predecessor to the SSD model, it also detects images in a single pass, but it uses two fully connected layers while the SSD uses multiple convolutional layers. The SSD model adds several feature layers to the end of a base network, which predicts the offsets to default boxes of different scales and aspect ratios and their associated scores.

The SSD produces an average of 8732 detections per class while the YOLO produces only 98 predictions per class.

Image classification in computer vision takes an image and predicts the object in an image, while object detection not only predicts the object but also finds their location in terms of bounding boxes. Single shot detector is faster in speed and it's very high in accuracy for object detection.

we use SSD algorithm mainly because this have 2 major benefits they are *anchor* box and grid cell

GRID CELL:

SSD divides the image using a grid and have each grid cell be responsible for detecting objects in that region of the image. Detection objects simply means predicting the class and location of an object within that region. If no object is present, we consider it as the background class and the location is ignored.

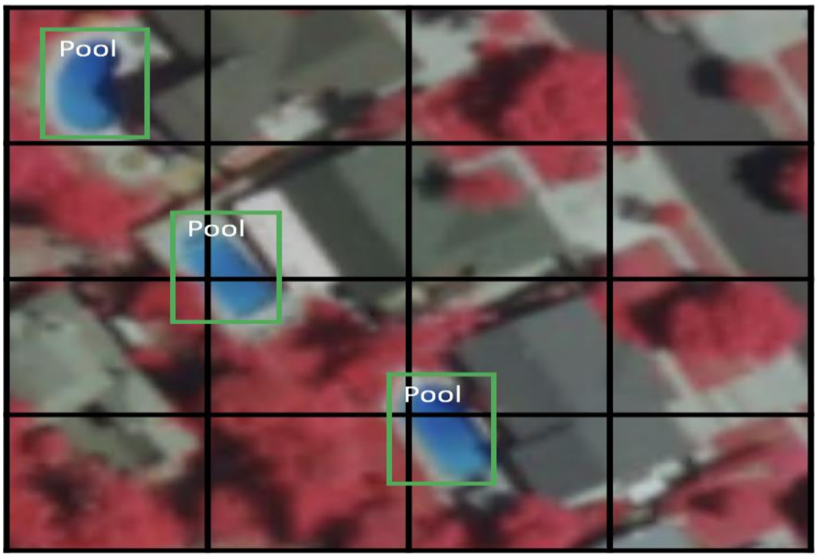


Fig 8.2 Grid cell

ANCHOR BOX:

Each grid cell in SSD can be assigned with multiple anchor/prior boxes. These anchor boxes are pre-defined and each one is responsible for a size and shape within a grid cell. SSD uses a matching phase while training, to match the appropriate anchor box with the bounding boxes of each ground truth object within an image. Essentially, the anchor box with the highest degree of overlap with an object is responsible for predicting that

object's class and its location. This property is used for training the network and for predicting the detected objects and their locations once the network has been trained. In practice, each anchor box is specified by an aspect ratio and a zoom level.

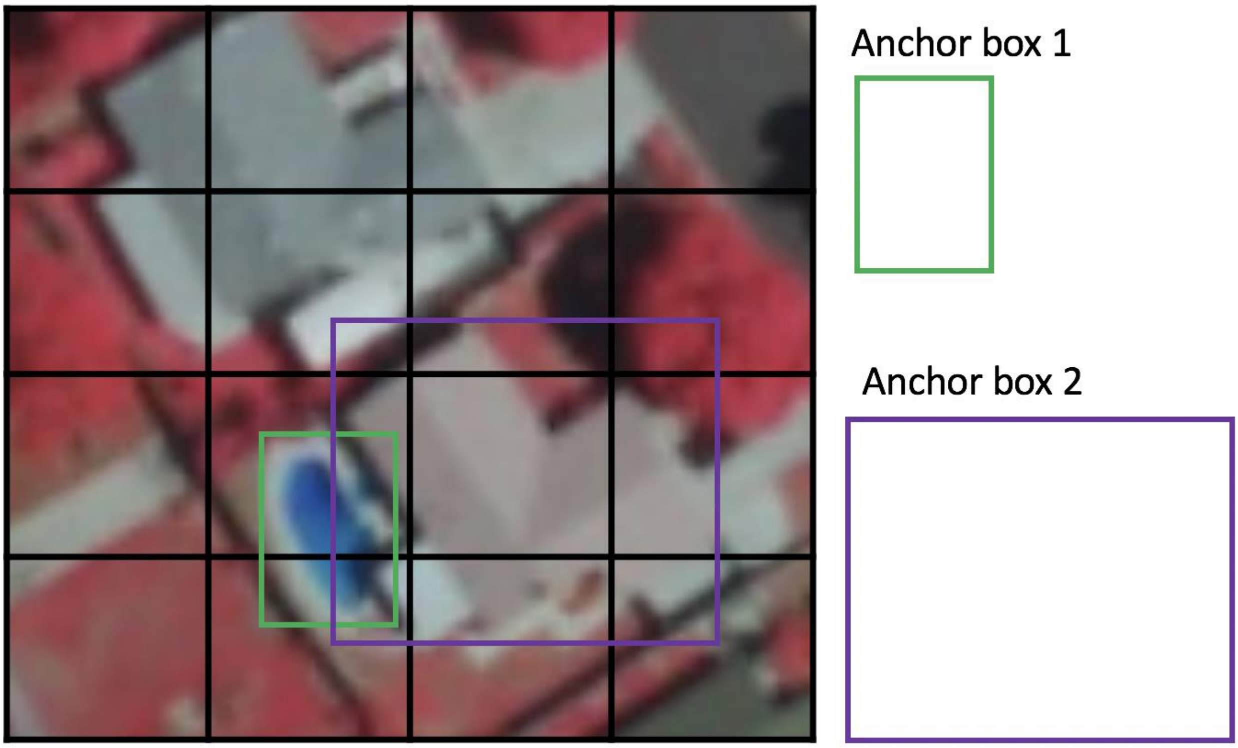
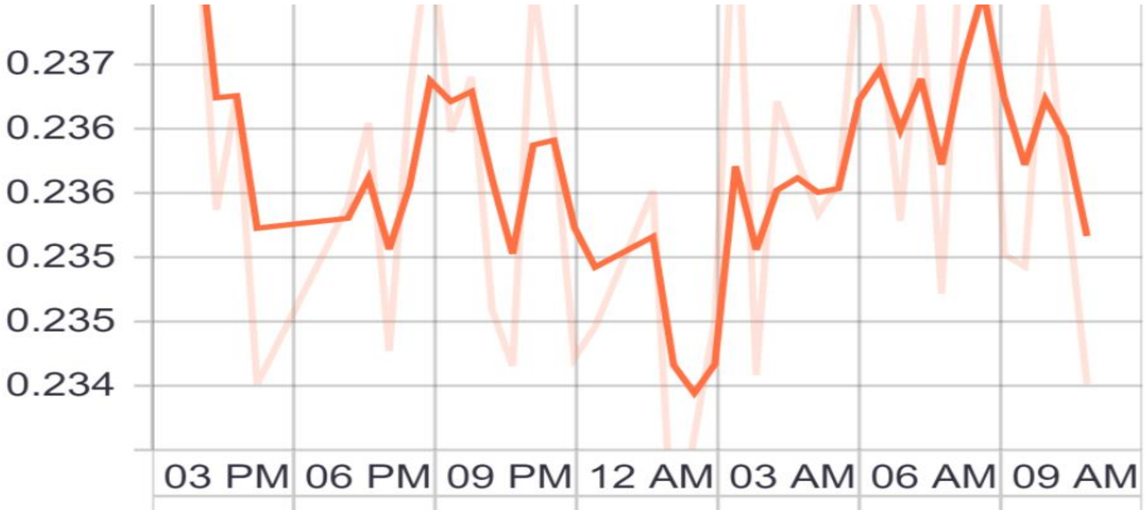


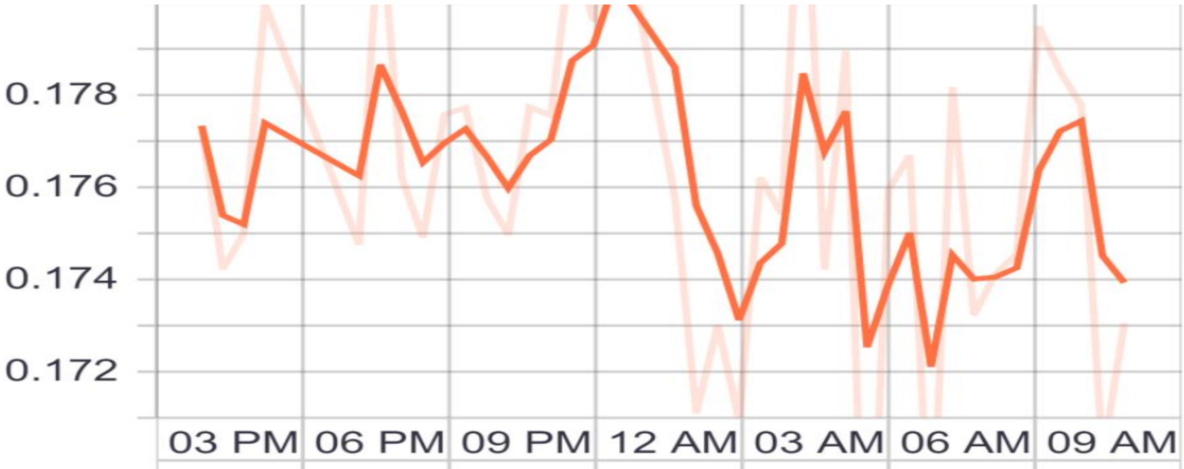
Fig 8.3 Anchor box

with the help of anchor box and grid cell we can find the object which is needed and can export the required box. In our case we need the number plate of the vehicle which met with the accident and later grid cell helps us to divide the image frame into a grid cells and extract the number plate in the image.

Training Set:



Validation set:



Test accuracy:

```
Test Loss: 0.177529

Test Accuracy of accident: 90% (468/517)
Test Accuracy of noaccident: 93% (890/947)

Test Accuracy (Overall): 92% (1358/1464)
```

Accident detection

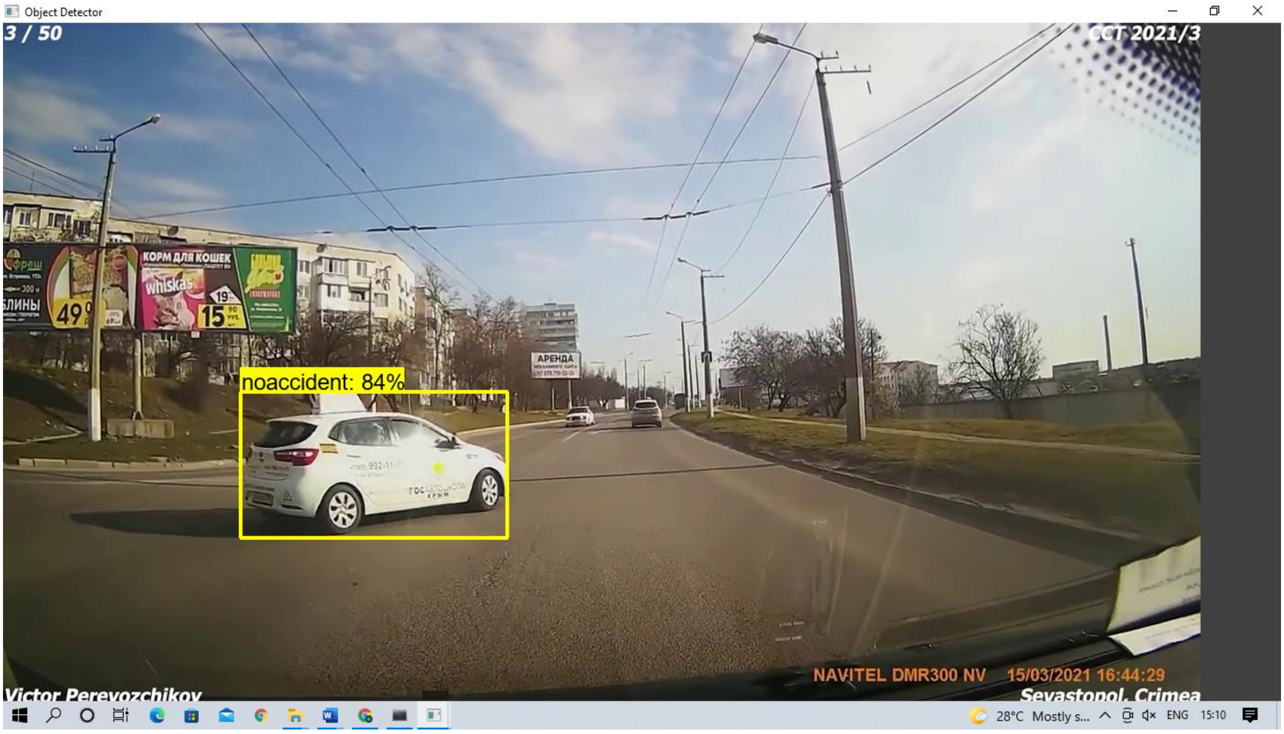


Fig 8.4 Detecting No Accident

while scanning the image frames when there is no accident detected the model runs in a loop and scan the new frames until the accident is detected

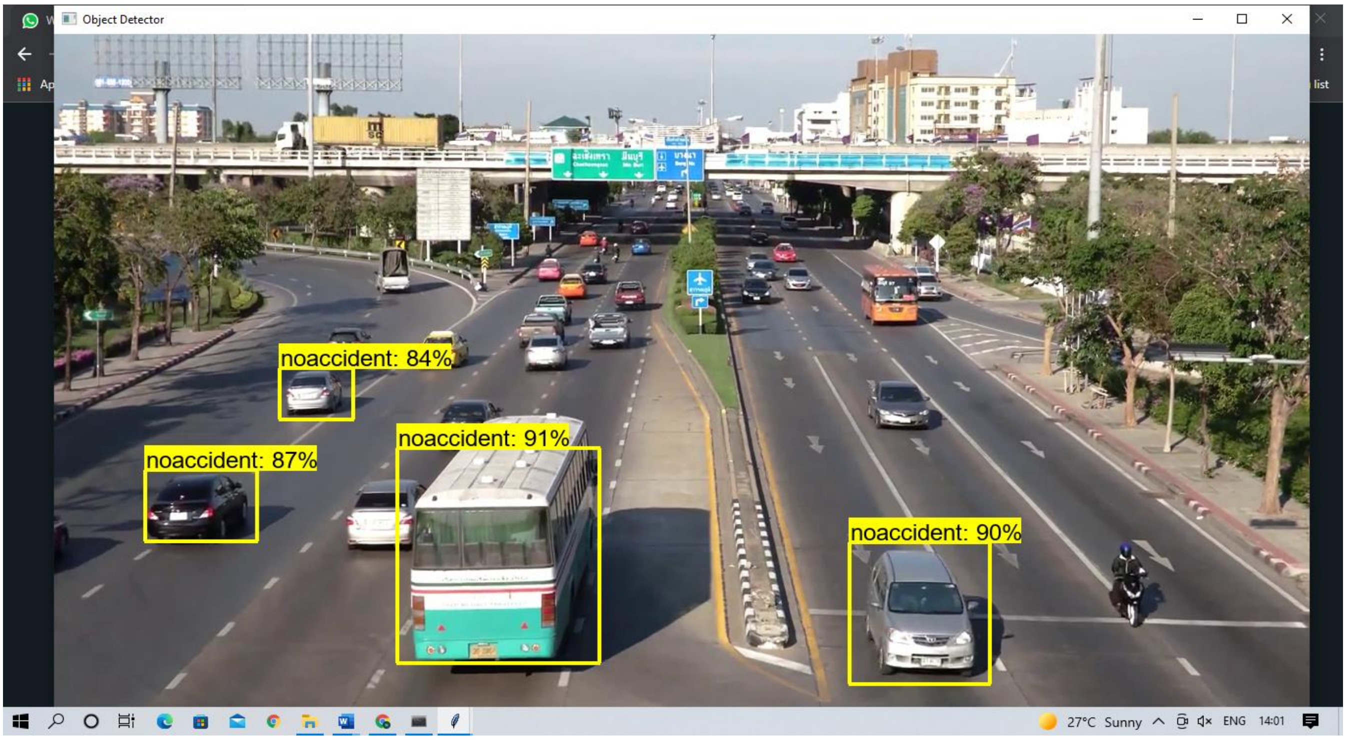


Fig 8.5 Detecting No Accident

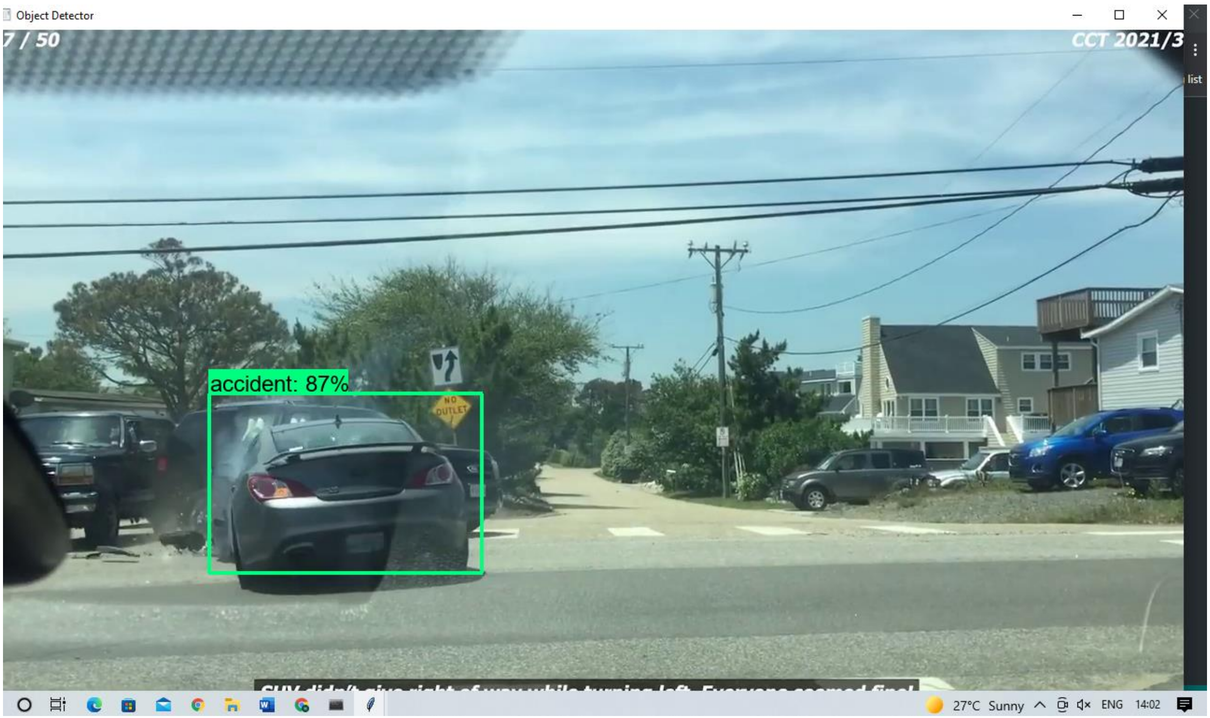


Fig 8.6 Detecting The Accident

the model is prepared so that when there is accident identified in the picture, for example, above picture it recognize the vehicle and mark it as accident

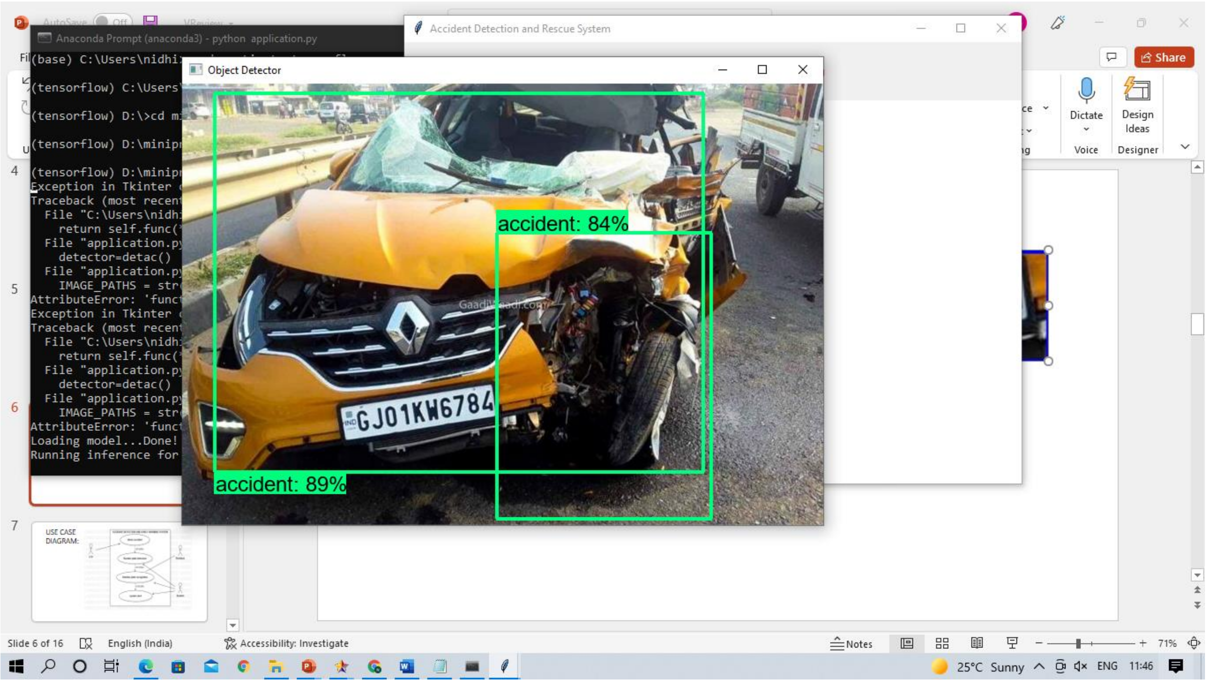


Fig 8.7 Detecting The Accident

Once the accident is detected the number is retrieved from the image. And then once the number is retrieved the corresponding details will be fetched from the database.

Fig 8.8 Number plate extraction

Once the numberplate is retrieved next step is to recognize the character in the numberplate using keras_ocr

Once the character is recognized the data is searched in the database

And the character of the numberplate is searched in database and the alert is send to the trustee using smtp library

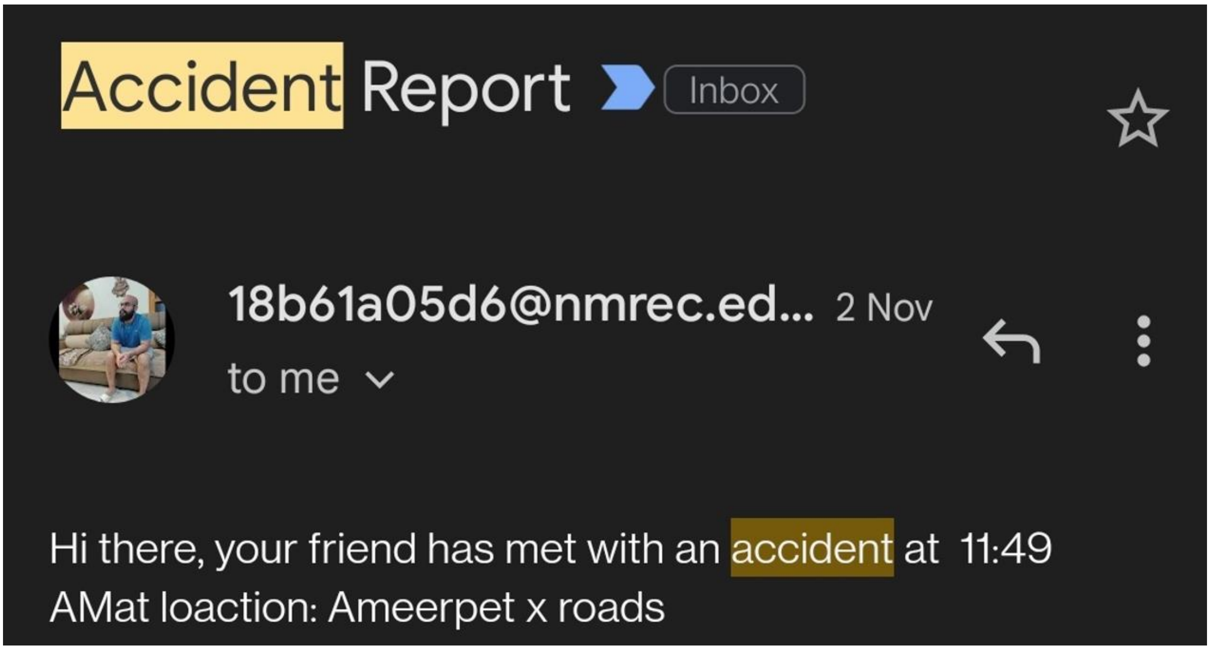


Fig8.9 Notifying the trustee

Once the character is recognized the data is searched in the database and the alert is send to the trustee and nearby hospital with IP address using smtp library

CHAPTER 10

CONCLUSION

Conclusion

Different methods for automatically detecting an accident with the help of CCTV surveillance videos are discussed and compared in this paper

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. Keras(OCR) and SSD algorithms. When the accident is detected the CCTV captures the incident and scans the number plate of the vehicle. And now the SSD and Keras algorithms have come into action. Keras scans the characters and the numbers from the number plate and checks in the database for fetching corresponding details of the victim, and an alert notification will be sent to the victim's trustees regarding the accident. in these way the death rate related to accident can be reduced by providing and instant alert to trustee and nearby hospitals

CHAPTER 11

FUTURE WORK

Future work:

Model used in this application can be trained further more with more checkpoints and huge data. By which the accuracy of the model will increase .

Multiple CCTV video feed can be given to the application to achieve parallel processing

Instead of alerting with email we can send an alert through sms.

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