

Project Synopsis  
on  
**HELMET DETECTION SYSTEM**

Submitted as a part of course curriculum for

**Bachelor of Technology**  
in  
**Computer Science**



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## **DECLARATION**

We here by declare that this submission is our work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

Signature of  
StudentsName:  
RollNo.:  
Date:

## **CERTIFICATE**

This is to certify that Project Report entitled “**HELMET DETECTION SYSTEM**” which is submitted by **Anuj Garg, Gagan Gupta and Divyansh Dhubkarya** in partial fulfilment of the requirement for the award of degree B.Tech. in Department of Computer Science of Dr A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

**Date:**

**Supervisor Signature**

Prof. ARUSHI GUPTA  
Assistant Professor  
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## **ACKNOWLEDGEMENT**

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# ABSTRACT

Violations in traffic laws are very common in a highly populated country like India. The accidents associated with these violations cause a huge loss to life and property. Since utilization of bikes is high, mishaps associated with bikes are additionally high contrasted with different vehicles. One of the main causes of these is not using motorcycle helmets. So we propose an approach called “TRAFFIC VIOLATION PROCTORING SYSTEM:HELMET AND TRIPLE RIDING DETECTION” using deep learning which automatically sends challan or send an SMS for individuals in case of identification of bicycle riders without headgear and who are triple riding utilizing surveillance videos in real-time. The proposed approach initially recognizes motorcycle riders utilizing background subtraction and object segmentation. At that point we utilize object classifier to classify violators. Since wearing helmet is critical while driving, our main aim is to decrease the danger of injuries in case of accident. By detecting the motorcyclists without helmets, triple riding or other violations we can therefore increase their safety while on road. Hence by automating we reduce the workload on the traffic control team and will be able to share the evidence with the team efficiently to impose fines on violators.

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# **Chapter1.Introduction**

## **Introduction**

All over the world around 1.35 million lives are lost each year, 50 million people are getting injured due to road accidents, according to a report titled “ The Global status Revised Manuscript Received on December 05, 2019 report on road safety 2018” released by world health organization. It is very hard to imagine that this burden is unevenly borne by motorcyclists, cyclists, and pedestrians. This report noted that a comprehensive action plan must be set up in order to save lives. Two-wheeler is a very popular mode of transportation in almost every country. However, there is a high risk involved because of less protection. When a two-wheeler meets with an accident, due of sudden deceleration, the rider is thrown away from the vehicle. If head strikes any object, motion of the head becomes zero, but with its own mass brain continues to be in motion until the object hits inner part of the skull. Sometimes this type of head injury may be fatal in nature. In such times helmet acts as life saviour. Helmet reduces the chances of skull getting decelerated, hence sets the motion of the head to almost zero.

Cushion inside the helmet absorbs the impact of collision and as time passes head comes to a halt. It also spreads the impact to a larger area, thus safeguarding the head from severe injuries. More importantly it acts as a mechanical barrier between head and object to which the rider came into contact. Injuries can be minimized if a good quality full helmet is used. Traffic rules are there to bring a sense of discipline, so that the risk of deaths and injuries can be minimized significantly. However strict adherence to these laws is absent. Hence efficient and feasible techniques must be created to overcome these problems. To reduce the involved risk, it is highly desirable for bike-riders to use helmet. Worrying fact is that India ranks in top as far as road crash deaths are considered. Rapid urbanization, avoiding helmets, seat belts and other safety measures while driving are some of the reasons behind this trend according to analysis done by experts. In 2015 India signed Brasilia Declaration on Road Safety, where India committed to reduce road crash deaths to 50 percent by 2020. Observing the usefulness of helmet, Governments have made it a punishable offense to ride a bike without helmet and have adopted manual strategies to catch the violators. However, the existing video surveillance-based methods are passive and require significant human assistance. In general, such systems are infeasible due to involvement of humans, whose efficiency decreases over long duration.

## **ProblemStatement**

Road safety is the most important aspect of this automobile driven technological world. Considering the number of people taking road transport as the means to reach their destination, the number of people reaching the heavens instead of their safe home, is increasing day-to-day. The irresponsible driving of the two-wheelers or the heavy speeding of the four-wheelers is the major reason for the occurring accidents. These irresponsible drivers are making it hard for the drivers that follow the traffic rules. The current increase in the fine/challan system might control these irresponsible drivers to an extent, but this is not a permanent solution that we can rely on. Existing system monitors the traffic violations primarily through CCTV recordings, where the traffic police must investigate the frame where the traffic violation is happening, zoom into the license plate in case rider is not wearing helmet. But this requires lot of manpower and time as the traffic violations frequently and the number of people using motorcycles is increasing day-by-day. What if there is a system, which would automatically look for traffic violation of not wearing helmet while riding motorcycle and if so, would automatically extract the vehicles' license plate number.

## **OBJECTIVE**

Motorcycle accidents have been rapidly growing through the years in many countries. In India more than 37 million people use two wheelers. Therefore, it is necessary to develop a system for automatic detection of helmet wearing for road safety. The objective of this paper is to develop a system to enforce helmet wearing with the help of CCTV cameras. The developed system aims in changing unsafe behaviors and consequently reducing the number of accidents and its severity.



## **Scope**

The overall purpose of this project is to reduce accidents caused by non-wearing of helmets and tripling on two wheelers. So in future we want to make the system accurate to detect non helmet wearing vehicles and make this his system best.

## **Chapter2**

### **LITERATURE REVIEW**

#### **1. Machine Vision Techniques for Motorcycle Safety Helmet Detection**

This paper presents a system which automatically detects motorcycle riders and determines that they are wearing safety helmets or not. The system extracts moving objects and classifies them as a motorcycle or other moving objects based on features extracted from their region properties using K-Nearest Neighbor / (KNN) classifier. The heads of the riders on the recognized motorcycle are then counted and segmented based on projection profiling. The system classifies the head as wearing a helmet or not using KNN based on features derived from 4 sections of the segmented head region. Experiment results show an average correct detection rate for near lane, far lane, and both lanes as 84%, 68%, and 74%, respectively.

#### **2. Smart Helmet Using GSM and GPS Technology**

In this, Author has discussed safety and security of the bikers against road accident. Smart helmet has special idea which makes motorcycle driving safety than before, this is implemented using GSM and GPS technology. Other advantages of this project is to measure the alcohol level of the drunken people who is riding the bike. Whenever the alcohol level crosses the predefined value, the alarm starts and get notification about the drunken driver. The author have also discussed about the accident detector and the sensor will active the GPS and find the location and further SMS will send to ambulance or family members.

#### **3. SMART HELMET– A Review Paper:**

According to the recent Research paper in 2016 titled ‘2 Helmet using GSM and GPS technology for accident detection and reporting system’, The author specially developed this project to improve the safety of the bikers. The objective of this project is to study and understand the concept of RF transmitter and RF receiver circuit. The project uses ARM7, GSM and GPS module.

The project also uses buzzer for indication purpose. Whenever the accident will occur then accident spot will be note down and information will send out on the registered mobile number. The major disadvantage of this project is they are not using any display device for showing the current status.

Also the cost of helmet is still high since helmet is designed for only one purpose. According to the Research paper in 2015 titled 'Microcontroller based smart wear for driver safety', In this paper author has discussed on the speed of the vehicle. In this application the project will be monitoring the areas in which the vehicle will be passing. On entering any cautionary areas like schools, hospitals, etc the speed of the vehicle will be controlled to a predefined limit. LCD is used for showing the various types of messages after wearing the helmet. The author has worked only on the phenomenon of accident which is generally happens due to drunk and drive. But as we know that the accident in the area is not happens only due to consuming alcohol but also other parameters like speed are also responsible.

#### **4. Literature Survey On Image Filtering Techniques**

Image processing has become a common technique for making images more comprehensible to the human eye. Images acquired are found to be corrupted with noise in many cases. There are many methods available to remove impulse noise in gray scale and color images. But very little has been done for the removal of additive noise in color images. Of the many filters presented, most of them are only for gray scale images. The filtering techniques developed for gray scale images can be extended to color images by applying it to the different color components separately but it is also evident that they can partially destroy image details. The existing systems includes Conservative Smoothing, linear filters, non-linear filters like median filter and fuzzy filter, adaptive filter, wavelet based filter etc. These techniques have a number of advantages and also disadvantages[3].

## **5.Digital Image Processing Techniques in Character Recognition of Indian Languages.**

This paper presents a brief overview of digital image processing techniques such as Feature Extraction, Image Restoration and Image Enhancement. A brief history of OCR and various approaches to character recognition is also discussed in this paper.

Handwritten character recognition is always a frontier area of research in the field of pattern recognition.

There is a large demand for OCR on hand written documents in Image processing. Even though, sufficient studies have performed in foreign scripts like Arabic, Chinese and Japanese, only a very few work can be traced for handwritten character recognition mainly for the south Indian scripts.

OCR system development for Indian script has many application areas like preserving manuscripts and ancient literatures written in different Indian scripts and making digital libraries for the documents. Feature extraction and classification are essential steps of character recognition process affecting the overall accuracy of the recognition system[10].

## **6. Limitations and challenges in Existing Systems:**

Bikers do not wear helmets in the region where traffic checking is not done. There is a tendency of the driver to wear helmet only where the anticipate checking may takes place, they do not wear helmet where no checking is done. The vehicle may be turn on or may be stolen by passing the ignition switch.

Testing alcohol content present in blood in each individual rider in big countries like India is almost impossible. Accidents due phone calls as previous helmets do not contain Bluetooth speakers.

## **7. Automatic detection of motorcyclists without the helmet.**

This paper aims to explain and illustrate an automatic method for motorcycles detection and classification of public roads and a system for automatic detection of motorcyclists without the helmet. For this, a hybrid descriptor for features extraction is proposed based on Local Binary Pattern, Histograms of Oriented Gradients and the Hough Transform descriptors. Traffic images captured by cameras were used. The best result obtained from classification was an accuracy rate of 0.9767, and the best result obtained from the helmet, detection was an accuracy rate of 0.9423.

## **8. Motorcycle Detection and Tracking System with Occlusion Segmentation.**

The method uses the visual length, visual width, and Pixel Ratio to detect the classes of the motorcycle occlusions and segment the motorcycle from each occlusive class. Because the motorcycle riders must put on their helmets, the helmet detection or search method is used to make sure whether the helmet/motorcycle exists or not. Experiments obtained by using complex road scenes are reported, which demonstrate the validity of the method in terms of robustness, accuracy, and timely responses.

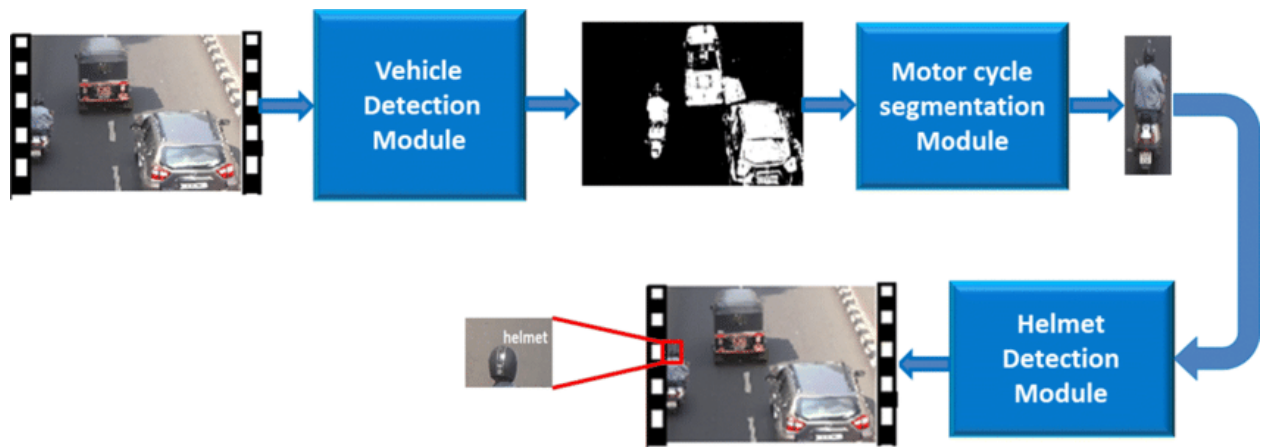
## **9. Automatic Detection of Bike-riders without Helmet using Surveillance Videos in Real-time.**

In this paper, we propose an approach for automatic detection of bike-riders without helmet using surveillance videos in real time. The proposed approach first detects bike riders from surveillance video using background subtraction and object segmentation. Then it determines whether bike-rider is using a helmet or not using visual features and binary classifier. Also, we present a consolidation approach for violation reporting which helps in improving the reliability of the proposed approach. In order to evaluate our approach, we have provided a performance comparison of three widely used feature representations namely histogram of oriented gradients (HOG), scale-invariant feature transform (SIFT), and local binary patterns (LBP) for classification.

## CHAPTER-3

### Proposed Methodology

#### Flowchart of Proposed Methodology:



### 2. Moving object detection:

The first task in helmet identification is to detect a moving vehicle. It is the first step before performing more sophisticated functions such as tracking or categorization of vehicles. Rather than immediately processing the entire video, the example starts by obtaining an initial video frame in which the moving objects are segmented from the background. Processing only the initial few frames helps to take the steps required to process the video. The foreground detector needs a certain number of video frames to initialize the Gaussian mixture model. The foreground segmentation process is not perfect and often includes undesirable noise. Next, we will find bounding boxes of each connected component corresponding to a moving vehicle. Generally, more than one blob is detected apart from moving vehicles such as pedestrians, trees, dogs and other small noises. All the blobs that consist of less than  $n$  number of pixels are discarded (in our case  $n$  is 150 pixels). This way, we only remain with the moving vehicle. But there are a lot of gaps in the blob, that is, it is not one coherent blob. We use the morphological opening to remove the noise and to fill gaps in the detected objects which makes the blob more coherent. Once the blob is found, the raw image is extracted that is hidden behind the blob.

### **3. Vehicle classification:**

The next step is to classify the moving vehicle extracted in the last part. To classify vehicle, we are going to use the number of machine learning algorithms, from classical machine learning algorithms to modern deep neural networks, to see which approach works best in vehicle classification with limited data. A vehicle can be classified into two categories two-wheelers or four-wheelers. We are only interested in two-wheelers Figure 1 since we want to detect the presence of a helmet. The system proceeds further only if a two-wheeler is detected. Else, it discards this vehicle and looks for other vehicles and the cycle continues. We will collect the training data required for the classification of a vehicle on our own. We will capture the images of various vehicles in various positions. Almost same number of images, 1000, were gathered for both the classes two-wheelers or four-wheelers. If there are equal number of training images from both classes then it eliminates the problem of class imbalance and leads to better performance of the classifier. The training images contain a vehicle surrounded by other objects of interest such as trees, footpath, how a vehicle is normally seen on roads. Although this dataset is not the most representative of the real world moving objects, it is still enough to train and test the effectiveness of various machine learning algorithms to check the feasibility of the approach. The images will be converted to grayscale. Raw pixel values were fed to the classifier.

### **4. Helmet detection:**

Using the same approach as applied to identify the type of vehicle, we detect whether the rider is wearing a helmet. The images that will be used to train a helmet detector will be cropped version of the two-wheeler images focusing on the head region of the rider. Using this technique, we will be able to maintain the class balance, that is, there will be same number of images where the rider was wearing a helmet and where the rider was not wearing a helmet. We used numerous machine learning classifiers in order to select the best one for this task.

### **5. License plate extraction:**

After the previous steps, in case if the rider of a two-wheeler is not wearing a helmet, our next step is to extract the license plate of the vehicle. We extract the region of interest from our cropped image by giving the appropriate coordinates.

# TECHNOLOGY USED

## 1. Software Requirement

Machine Learning Libraries: TensorFlow, OpenCV Scripting language: Python

Database: MongoDB / Cloud storage (AWS)

Platform: Linux, Windows

API tools: Coco API / YOLOv2 API

Dataset: Mnist, CIFAR-10

## 2. Hardware Requirement

Hardware: 8GB RAM, 6GB Graphics, i7 Processor

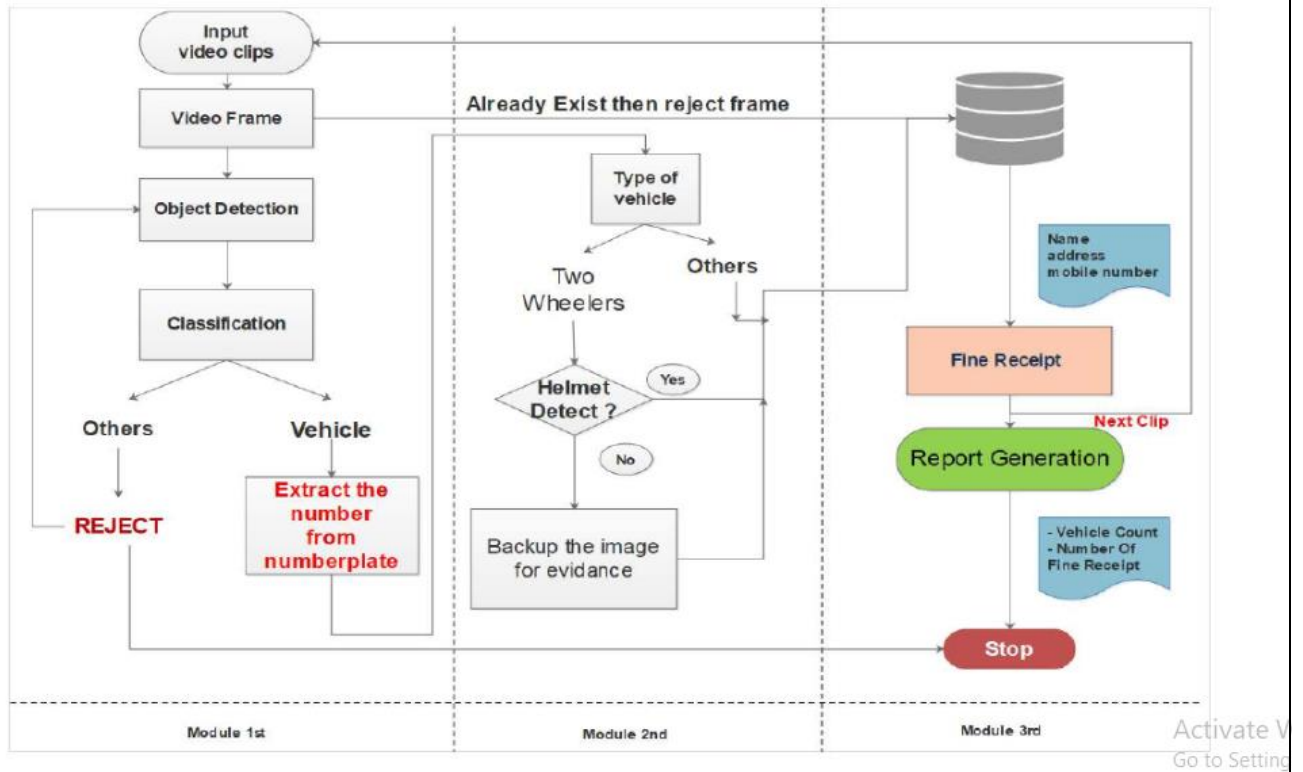
Graphics Driver: NVIDIA GTX 1050



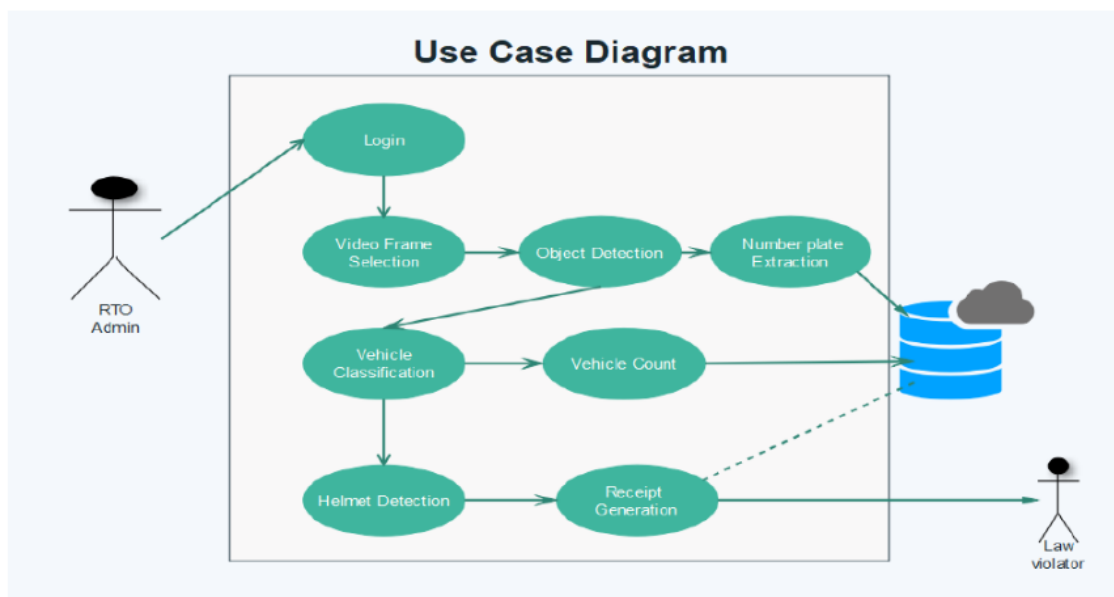
## CHAPTER-5

### DIAGRAM:

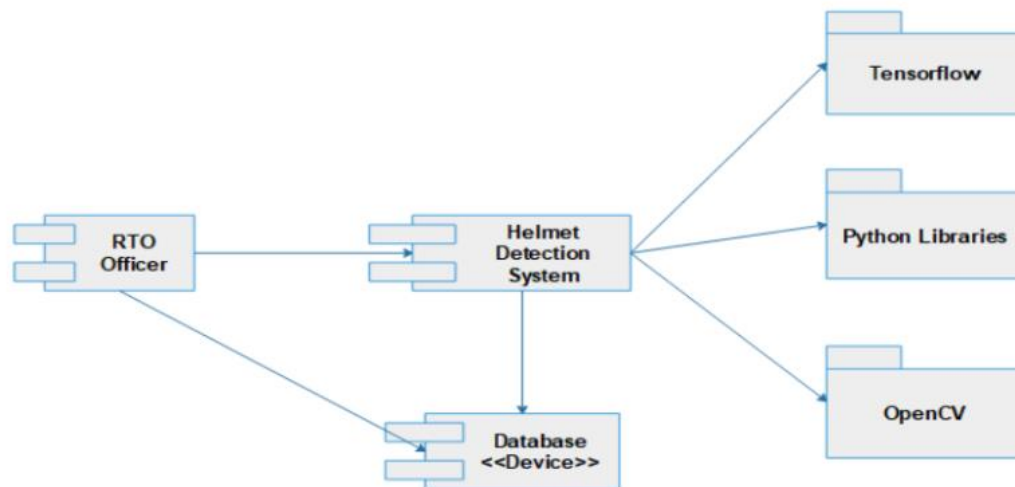
#### 1. System Architecture



#### 2. Use Case Diagram:

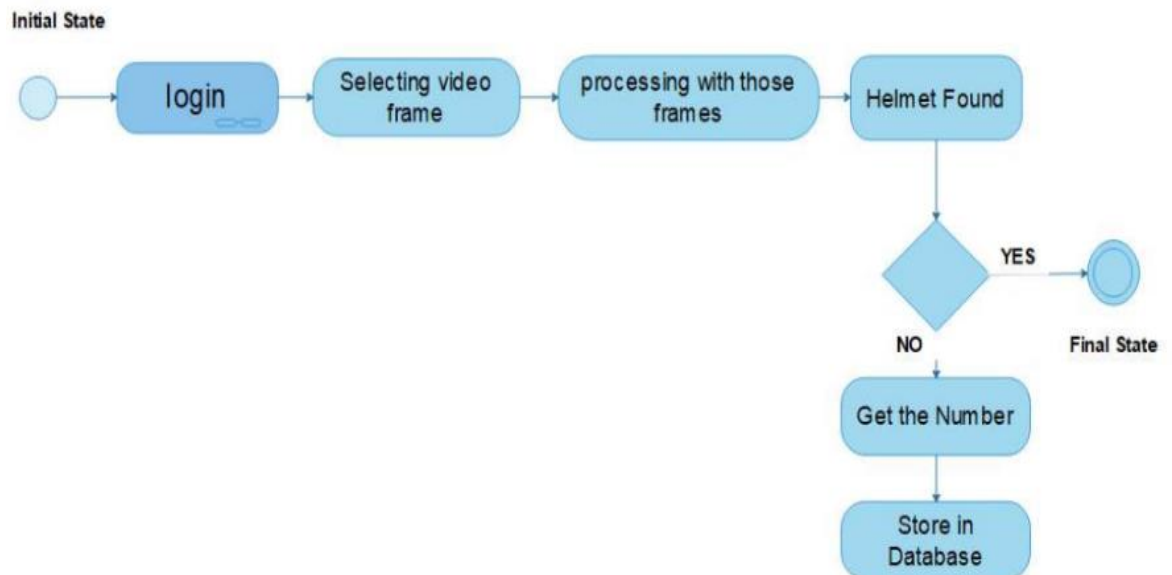


### 3. Component Diagram



Activate \

### 4. Activity Diagram



Activate \

## **CHAPTER-6**

### **CONCLUSION**

Thus this system is very effective for the safety purpose of the user. User has to wear helmet to ride a bike and hence traffic rules will be followed by the rider. This system is under pocket control i.e. Riding the two wheeler vehicle having safety in hand and in budget. This system has easy functionalities. It provides a better security to the biker.

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