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An Intelligent Way to Generate and Track Traffic Challans with the Power of ML and IoT

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***Abstract*—Nowadays due to growing population the use of vehicles on roads has been increased randomly. Due to fast moving life violating traffic rules has become common. This paper presents an idea of automation of detecting helmet and car seat belt using machine learning with image processing and internet of things (IOT). The proposed approach first classifies the different objects passing through the junction using surveillance cameras and then verifies whether the biker is wearing helmet or the car driver is wearing seat belt or not. Based on the result the message regarding fine will be sent to the concerned object rider registered mobile number. In addition the proposed paper also classifies the different types of car number plates to have a record with RTO about the number of cars.**

***Index Terms*— Machine Learning, IoT,RTO,RTA,HSV.**

I. INTRODUCTION

2-wheelers and 4-wheelers are very popular mode of transportation in every country. However, due to protection ignorance there are chances of high risk . To reduce the overall risk involved, it is necessary for bike-riders to use helmet and car riders to wear seat belt. Considering the importance of helmet and seat belts, Governments have made it a punishable offense to ride a bike without helmet and car without a seat belt. It has 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 unfeasible due to involvement of humans, whose efficiency decreases over long duration. This process should be automated to have good and robust monitoring of this contravention and it reduces the amount of human resources needed. Also, many countries are adopting systems involving surveillance cameras at public places. To detect violators using the existing infrastructure is cost- effective. In present scenario if the bikers are not wearing the helmet then the surveillance cameras on road will take the videos which are then filtered by humans and then the messages are being sent to registered mobile numbers. But due to human intervention it becomes a time consuming task. As CCTV captures the low resolution videos the quality of video also detoriates [11].
In Real-time Implementation processing significant amount of information in a time constraint manner is a challenging task. As such applications involve tasks like segmentation, feature extraction, classification and tracking, in which a significant amount of information need to be processed in short duration to achieve the goal of real-time implementation. In real life scenarios, the dynamic objects usually occlude each other due to which object of interest may only be partially visible. Segmentation and classification become difficult for

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these partially visible objects. Over time, there are many changes in environment conditions such as illumination, shadows, etc. There may be subtle or immediate changes which increase complexity of tasks like background modeling. Also, conditions such as low light, bad weather complicate it further. Due to such limitations, tasks such as segmentation, classification and tracking become even more difficult. As such successful framework for surveillance application should have useful properties such as real-time performance, fine tuning, robust to sudden changes[7].

II. WORKING

In the proposed approach there will be multiple cameras attached on the road at significant distances which will continuously take the images of the traffic moving on the roads. Based on the images collected for an particular object, an image enhancement, filtration would be done and the best clear picture will be considered. Basically we use grey level mapping [7]. The enhanced image will be classified by using classification algorithm into three different categories like pedestrian or bicycle, 2 wheeler and 4 wheeler (heavy vehicles). The 2 wheeler head trajectory will be taken for detection of helmet using supervised learning. If the biker is not wearing the helmet then using edge detection the number from the number plate will be retrieved. The retrieved number will be checked within the database. If the 2 wheeler registered number is present then the record will be retrieved from the database and checked within the number of fines or penalty paid. If the attempts are over or the fine is not paid then action will be taken of cancelling the license. If number of attempts is not over or fines are paid then an SMS will be sent to registered mobile number intimating about the fine. The same will get updated in the database. If the 2 wheeler numbers is not registered then it will get updated in another database as unknown and intimated to take further action. In case of 4 wheeler the image will be taken and using the boundary detection algorithms and edge detection the verification will be done of the driver wearing seat belt or not [10]. If not again the vehicle number will be checked in the database and based on it the fine message will automatically sent to registered number. Also the proposed work maintains a count of the total number of big vehicles roaming on the roads based on their number plates. The vehicles are classified based on the color of the number plates. In this the extraction of vehicle region will be done and converted to HSV model. The different number plates are:

1) White number plate: - White number plate with black letters is used as private vehicles. These vehicles can be used for private purpose only and not for commercial.
2) Yellow number plate: - yellow number plate with black letters is used for commercial purpose only like taxis. It has different tax structure and RTO rules.
3) Black number plate:- Black number plate with yellow writing are issued to car or bike rental companies. Self driving motor cars or bikes.
4) Number plate with upward pointing arrow:-Such vehicles belong to defense. The Army registration denotes the class of the vehicle, its base, and the year the Army procured the particular vehicle, along with its serial number.

A database will be maintained having a record of all these number plates. Whenever a 4 wheeler is moving on the roads , it will be checked with the database of the RTO and if the number is not present then it would get added in the database belonging to that particular category. Thus at the end the RTO will have the idea of how many vehicles are there in an particular city.

III. ALGORITHM 1: STRUCTURAL PROCESS FLOW

Output: - Send an SMS of fine for the biker not wearing helmet and driver not wearing seat belt

Start

Step I: Cameras installed on roads will take the images of the objects moving.

Step II: Using gray level mapping the images of same type will be filtered and enhanced

Step III: Elementary level classification will be done to classify as pedestrian, bicycle, 2 wheeler and 4 wheeler

Step IV. I: if (image == pedestrian || image ==bicycle) then no action

Step IV.II: else if(image == 2 wheeler) then using feature extraction and supervised learning an classification model will run and classified as bikers wearing helmet and not wearing helmet.

Step IV.II.I: if(image== wearing helmet) then no action Step IV.II.II: else if(image ==not wearing helmet)

then run edge detection to retrieve the image of number plate. Check the number plate record in database

Step IV.II.II.I if present then retrieve the record if (fine attempts exceed || not paid fines)

then cancel license and send a message

else send an SMS for fine and update the database.

Step IV.II.II.II else add the vehicle number in another database as unknown. Step IV.III else (image==4 wheeler)

use boundary detection algorithm to detect presence of helmet or not. Step IV.III.I: If (image== wearing seatbelt) then no action

Step IV.III.II: else if(image ==not wearing seatbelt)

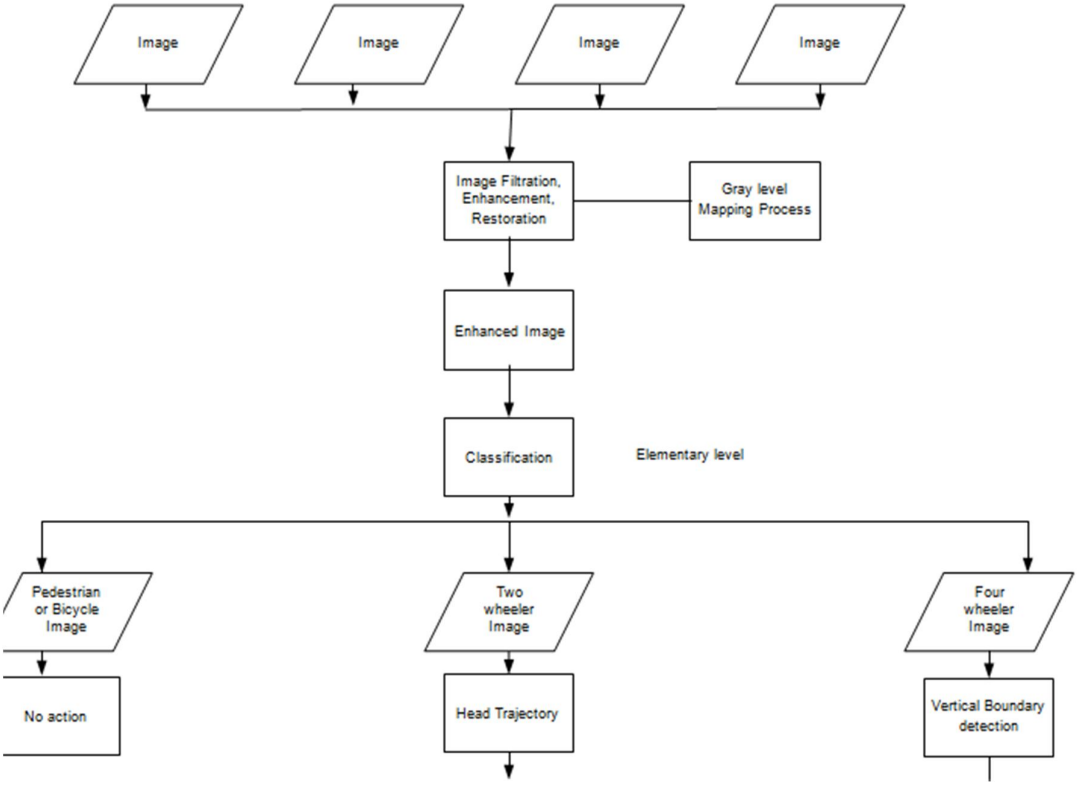
then run edge detection to retrieve the image of number plate. Check the number plate record in database

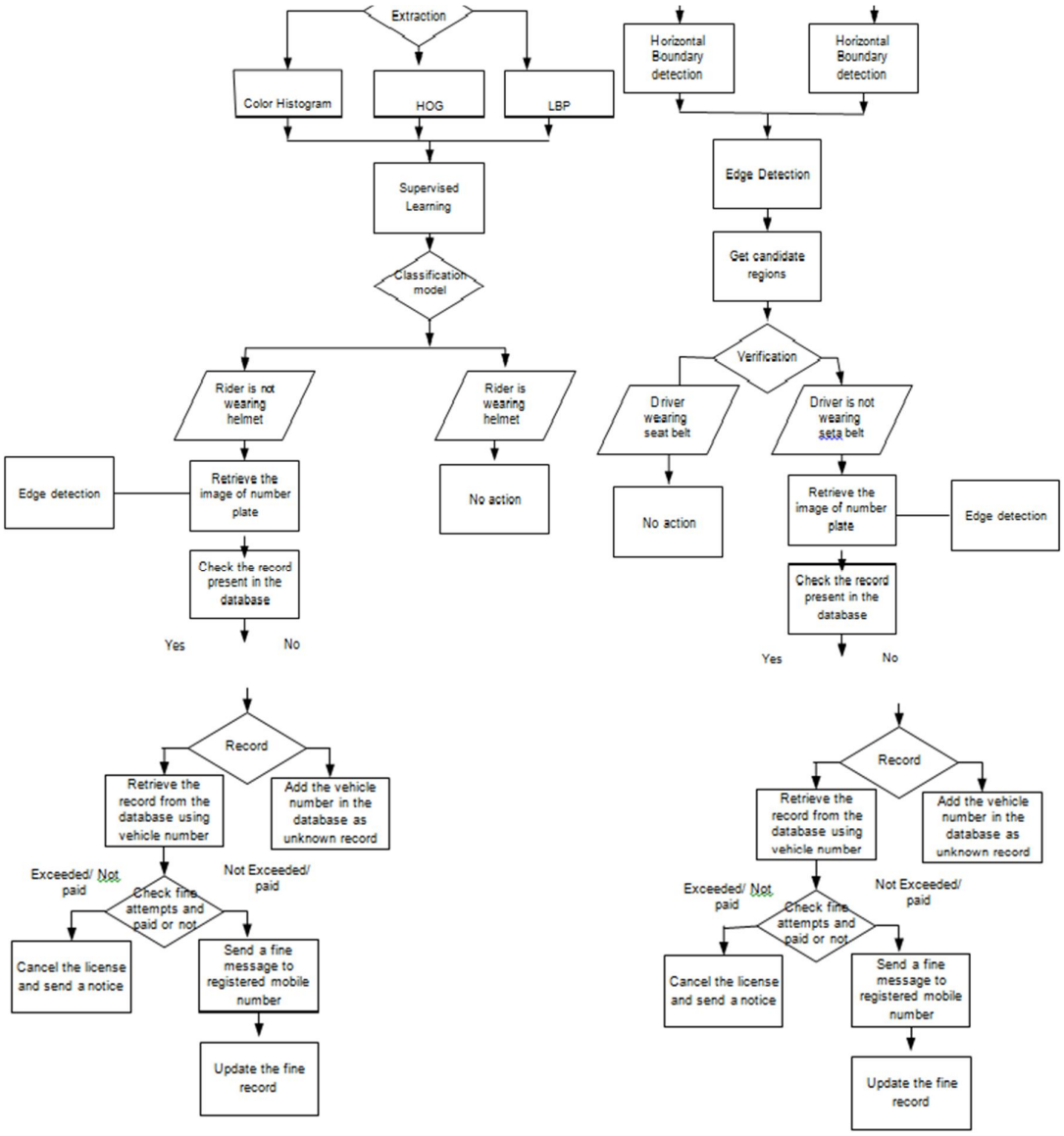
Step IV.III.II.I If present then retrieve the record

If (fine attempts exceed || not paid fines) then cancel license and send a message

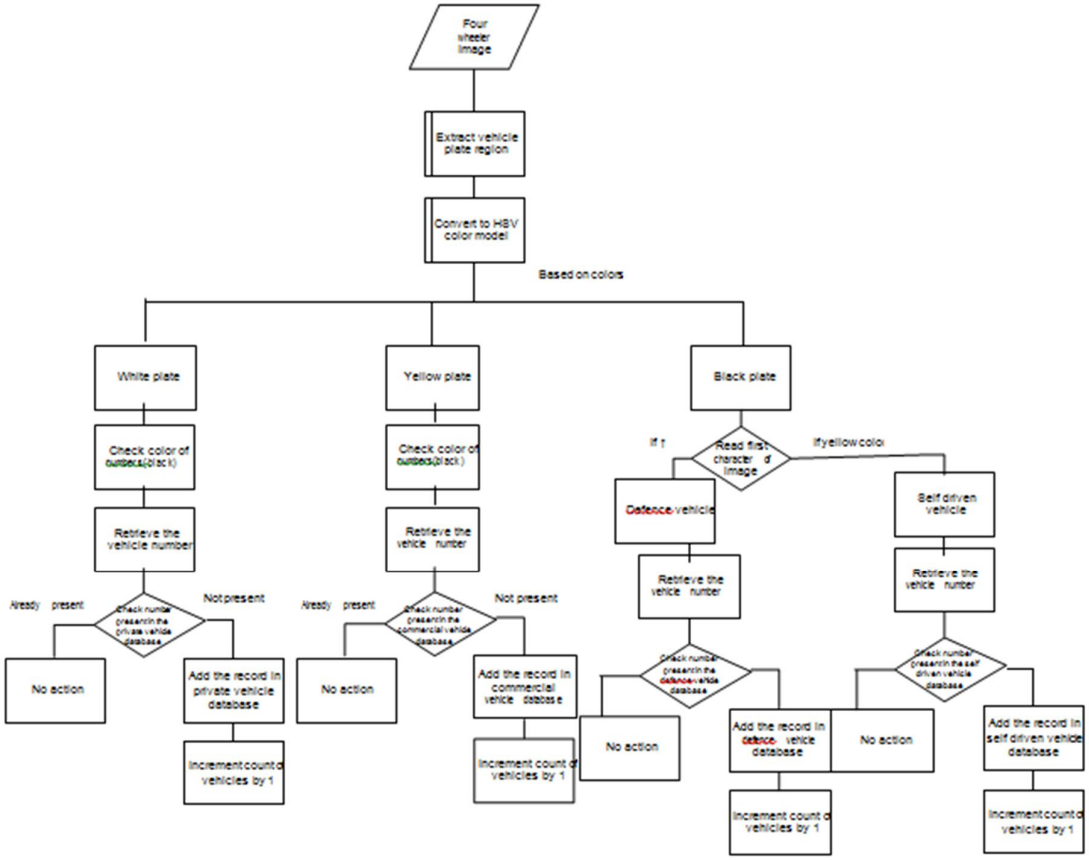
else send an SMS for fine and update the database. Step IV.III.II.II else add the vehicle number in another database as unknown.

Stop





Flowchart III.1:Structural flow of the process



Flowchart III.2: Number plate classification of vehicles

ALGORITHM 2: Classification and Counting of vehicles (Flowchart III.2) Input: Images of 4 wheelers

Output: Count

Step I: Take the image of the 4 wheeler from Step IV.III of algorithm 1 Step II: Extract the vehicle plate region and convert to HSV color model. Step III: Based on colors of number plate

Step III.I: if(color == white)

then check the colors of characters on the plate if (colors of characters==black)

then private vehicle and check the number present in private vehicle database if(already present) then no action

else add the number in the private vehicles database and increase count by 1.

Step III.II: else if(color == yellow)

then check the colors of characters on the plate if (colors of characters==black)

then commercial vehicle and check the number present in commercial vehicle database if(already present) then no action

else add the number in the commercial vehicles database and increase count by 1.

Step III.III: else if(color == black)

then check the characters on the plate or the color of alphabet if (first characters==↑)

then defense vehicle and check the number present in defense vehicle database if(already present) then no action

else add the number in the defense vehicles database and increase count by 1 if (color==yellow)
then self driven vehicle and check the number present in self driven vehicle database if(already present) then no action
else add the number in the self driven vehicles database and increase count by 1

Stop

IV. Conclusion and Future Enhancement

Driving is a necessity for everybody. But millions of bike and car accidents occur every year and Government always tries to take necessary action to reduce it. It proves as a major loss to human resources but it can be minimized by wearing helmet and seat belts. Thus the proposed paper minimizes the human intervention in sending the fine messages to concerned vehicle numbers. Also it helps in counting the number of vehicles present in the city so that RTO can have actual count. Computer vision, image processing, machine learning algorithms can be applied to detect the biker wearing helmet and driver wearing seat belt with the power of AI and Machine Learning algorithms like tensor flow we can predict best possible ways to send the notifications to RTA and the Persons.

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