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Enhancing Road Safety System using Machine Learning Techniques

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Abstract - *The most important aspects in an accident investigation are the license plate detection and driver drowsiness detection. License plate detection uses the novel algorithm.[1] It is containing three segments: license plate detection, individual number and character extraction, and number and character recognition. In the image, noise is removed by Gaussian blur filter and then using modified canny algorithm the numbers and characters are recognized using k-nearest neighbor classifier. Driver drowsiness detection algorithm is based on the state of eyes of the driver which is determined by his iris visibility. If driver's eyes remain in one state either open or closed longer than expected time as well as if the driver is not facing front, it is an indication that driver is drowsy and then the system warns the driver by making alarm. It uses Viola Jones algorithm to detect the objects such as nose, mouth or upper body and captures the image. An image was captured and then, rectangular eyes area was adjusted to reduce the noise. The drowsiness detection uses Black to White pixels ratio, number of pixels in the column greater than the threshold value and eye's shape. The Alcohol sensor fixed on helmet is used to prevent driver to drink and drive scenarios.*

Key Words: Machine Learning, classification, OCR, ESP8266, Drowsiness, OpenCV

1. INTRODUCTION

We know that young generation prefers bikes and motorcycle over four wheelers. Moreover speeding and drunk driving have become common issues.[3]Due to lack of our experience or focus and violation of traffic rules, result in several accidents. So with the help of technology problems mentioned above are avoided and their effects are minimized. The idea of developing this project t comes from our social responsibility towards society.

Almost all vehicle are captured in CCTV cameras. So it is not easy to detect and recognize license plate correctly. To overcome this problem, we propose an algorithm that automatically recognizes license plate using a CCTV camera footages. A license plate detection and recognition is one of important processes in investigating a car accident.[2] The new license plate format is made up of ## (letter) #### where # is a number.[9]

Driver Drowsiness Detection is one of the car safety features that helps prevent accidents caused by the drowsy driver. According to the Central Road Research Institute (CRRI) in Indian says that 40% of highway accidents occur due to drivers dozing off.

However, the main goal of our project is to make it mandatory for the rider to wear a helmet during the ride meanwhile providing solutions to other major issues for accidents.

2. RELATED WORKS

2.1 Drowsiness Driver Detection

By using a non-intrusive machine vision-based concepts, drowsiness of the driver detected system is developed. Many existing systems require a camera which is installed in front of driver. .[2] It points straight towards the driver's face and monitors the driver's eyes to identify the drowsiness. For large vehicle such as heavy trucks and buses this arrangement is not apropos. Bus has a large front glass window to have a broad view for safe driving. If we place a camera on the window of front glass, the camera blocks the frontal view of driver so it is not practical. If the camera is placed on the frame which is just about the window, then the camera is unable to detain the anterior view of the face of the driver correctly. [7]The open CV detector detects only 40% of face of driver in normal driving position in video recording of 10 minutes. In the cater-cornered view, the Open CV eye detector (CV-ED) frequently fails to trace the pair of eyes. After five successive frames if the eye found to be closed the system finalise that the driver is declining slumbering and issues a warning signal. Hence existing system is not applicable for large vehicles. In order to conquer the problem of existing system, new detection system is developed in this project work.

2.2 Automatic Number plate Detection

ANPR System utilizing OCR at the center point of the framework is the OCR (Optical Character Recognition framework) which is utilized to extricate the alphanumeric characters present on the number plate. . [1] There are just two segments in the framework, the web cameras at the front-end and the remote PCs at the back-end to process the information. The remote PCs pre-process the perform activities like OCR on the put away pictures sent by the cameras at the path level A case of a server ranch can be the London Congestion Charge venture. [9] The remote PCs can be connected with the database which stores the subtleties of the vehicle

proprietors and hence the necessary data can be gotten. Utilizing this data the outlaw can be gotten.

The current framework utilizing OCR was found to have the accompanying disadvantages:

1. Misidentification:

2. Dim pictures:

3. Defects in rakish recognition

2.3 Smart Helmet Bike Starter

The task has a wired correspondence and it is associated with a Microcontroller. This uses sensors to recognize a head protector or liquor discovery and the correspondence frameworks is utilized to consequently kill the start. The other existing framework has the speed cutoff wherein the biker is going in.[3]The cap has been fixed with speed sensor and as needs be educate the rider to decrease or speed up dependent on the snags before the bicycle. First we need to guarantee that climate rider is wearing protective cap or not.

This has following burdens:

1.Rider doesn't wear head protector in districts where traffic checking isn't finished.

2.It is conceivable to test liquor content present in blood in every individual rider in large nations like India is unimaginable.

3.Difficulty of usage of traffic administers by traffic police.

3. PROPOSED CLASSFICATION

3.1 Drowsiness Driver Detection-Euclidean

Squint discovery can be assessed by estimating EAR (Eye viewpoint Ratio) utilizing OPENCV capacities and DLIB's pre prepared Neural system based expectation and finder function.[4]In Figure-1 it shows EAR can be estimated from eye organizes came back from OPENCV utilizing EAR recipe given underneath. Unexpected plunge in EAR esteem against a set limit can be utilized for flicker recognition and miniaturized scale rest discovery appeared in Figure-2.

$$EAR = \frac{||p2 - p6|| + ||p3 - p5||}{2||p1 - p4||}$$

Fig -1: The Eye Aspect Ratio Equation

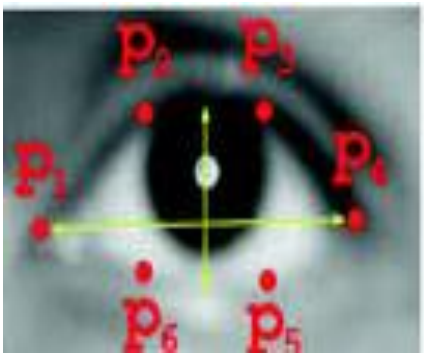


Fig -2: Results of facial Landmark detection and identification of eye coordinates

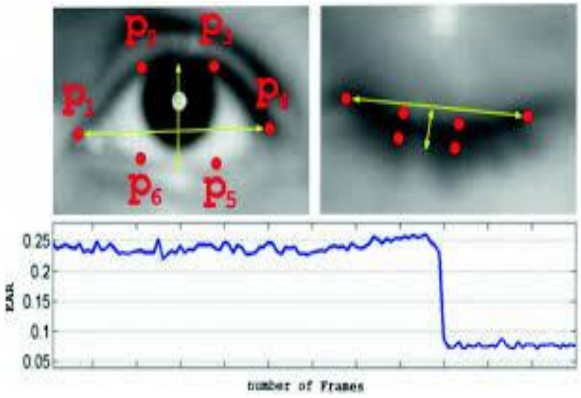


Fig -3: Results of Eye Blinking Detection

3.2 Automatic Number plate Detection

To recognize the number plate in the vehicles we use K-closest neighbor (KNN) classifiers to distinguish these isolated characters.[5] The calculation K-closest neighbor (KNN) measures KNN is more comparative than PNN (Probabilistic Neural Network) calculation and its acknowledgment rate is up to 96.51 % by and large. [11] The acknowledgment rate on normal is about 95.87 % for the PNN classifier and about 96.51 % for the KNN classifier.

The most noteworthy acknowledgment rate for all contentions and square sorts for PNN are 97.14 %, the most noteworthy acknowledgment rate for all case and square sorts for KNN are 100 %.[8] The most noteworthy acknowledgment rate for square kind is square 5x5, and the second is 10x5, regardless of which classifier.

Their acknowledgment rates are 96.97 % (PNN) and 99.77(KNN), separately

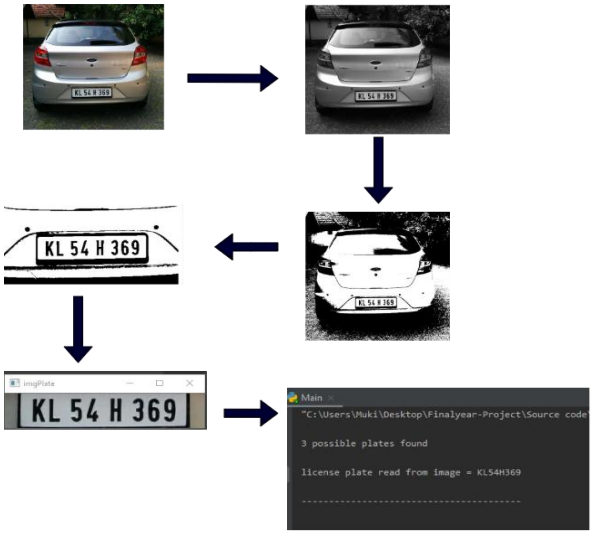


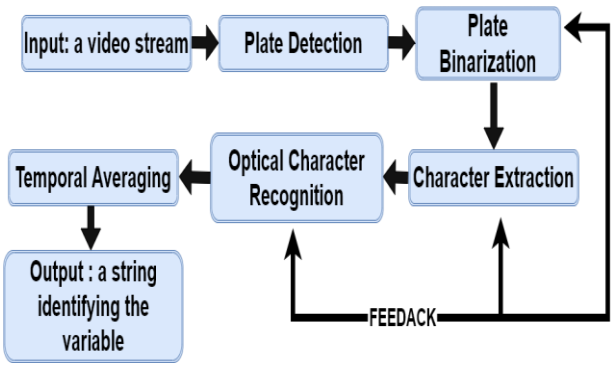
Fig -4: Steps for Detecting Number Plate

3.3 Drowsiness Driver Detection-Euclidean

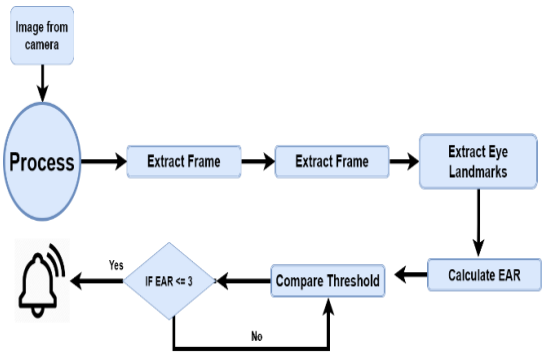
The savvy protective cap distinguishes if the rider has expended liquor and driving. In the event that the rider is devoured liquor, at that point the start arrangement of the bicycle will be killed and the subsequently not permitting the rider to ride the bicycle. .[3] In this proposed framework we utilize an ESP8266 microcontroller interfaced with MQ3 Alcohol sensor , it intermittently sends the breath and sends to the microcontroller.[6] The ESP8266 microcontroller on break down liquor signal from sensor and send the information to engine utilizing RF transmitter and we associate a RF recipient to the engine driver which stops dc engine to exhibit as motor locking. The proposed framework needs separate catch to turn over the motor of the bicycle. On the off chance that it finds the rider expending the liquor it naturally kills the motor and not permitting the rider to begin the bicycle.

4. ARCHITECTURE

4.1 Automatic Number Plate Detection

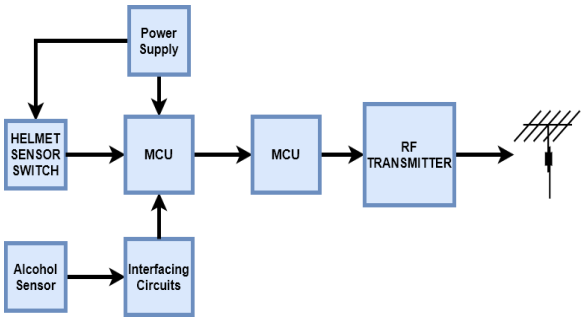


4.2 Automatic Number Plate Detection

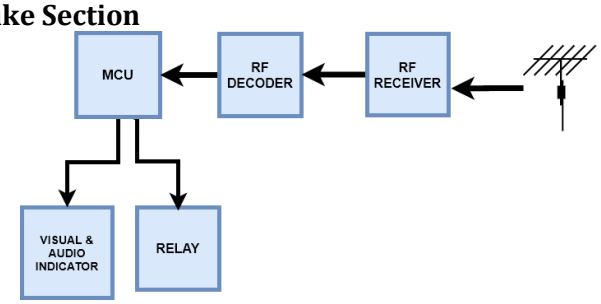


4.3 Smart Helmet Bike Starter With Alcohol Detection

Helmet Section



Bike Section



5. RESULT AND DISCUSSION

5.1 Drowsiness Driver Detection

- Software Requirements
- The webcam of the HP laptops
- HP laptop (Elite book 840 G1)
- CPU-Core-I5, 2.4 GH
- RAM-8.0 GB
- Graphic card: GeForce GT 230M
- 64-bit windows OS.

It takes the 60 edges for every second and dissect the sluggishness of the driver.

Table 1(License Plate Detection through Haar-Training) depicts the consequences of the proposed framework [24] The accompanying shows the different estimates actualized in the framework

•Detection disappointment it displays the disappointment pace of the framework

•Warning pace of the framework is given by as follows

$$Correct\ rate = \frac{Total\ frames - Detection\ failure}{Total\ frames}$$

Figure 5 portrays the determined estimations of the right rate for each tried example the right admonition pace of tiredness identification. Here we can accomplish higher than 99.2% and the normal right rate can accomplish 99.45%.

Figure 6 portrayed the determined proportion of exactness for each occasion:

$$Precision\ rate = \frac{correct\ warning}{Generated\ warning}$$

The outcome portrays the exactness of the proposed arrangement of learning. The outcome differs with the accompanying viewpoints:

- No. of caught outlines
- Size of the eye
- Eye leeway (with or without eyeglass)

With expansion, the preparation dataset assume the most significant job in indicating the exhibition of the system.[8]

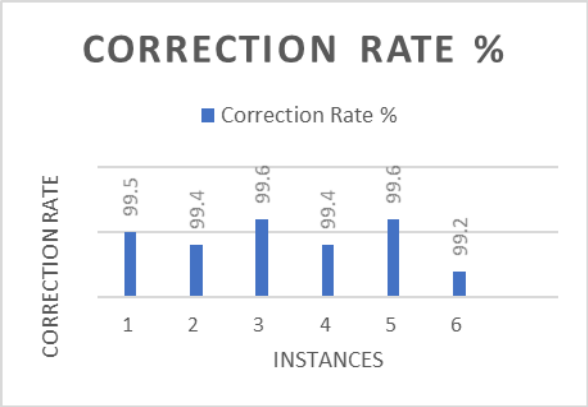


Chart -1: **Correct rate for each experiment instance**

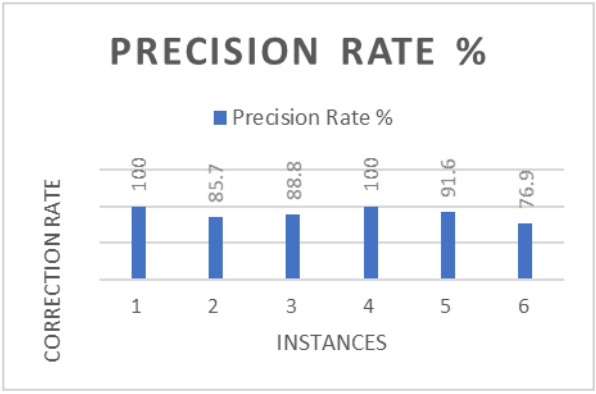


Chart -2: **Correct rate for each experiment instance**

5.2 Automatic Number Plate Detection

We gathered 30 pictures of Indian vehicles having tags in various light conditions.[9] We partitioned those pictures in to 3 of the gatherings and every one of the gathering has 10 pictures. We have named those gatherings A, B and C respectively.[22]. We tried our own experiments on these gatherings which are additionally talked about in following segments.

License Plate Detection

As we experience the beforehand in Architecture and Implementation sections, we have actualized two calculations for tag identification: Haar-Training and KNN. We tried our own experiments on these techniques independently to analyse their presentation

Table -1: License Plate Detection through Haar-Training

Groups Plates	Total License Plates	No. of Detected License	Detection Rate (%)
Group A	10	8	0.8
Group B	10	9	0.9
Group C	10	9	0.9
Results	30	26	0.86

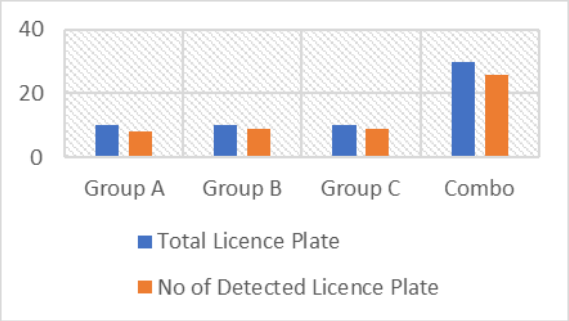


Chart -3: License Plate Detection through Haar-Training

Table -2: License Plate Detection through KNN-Training

Groups Plates	Total License Plates	No. of Detected License	Detection Rate (%)
Group A	10	9	0.9
Group B	10	10	1
Group C	10	10	1
Results	30	29	0.96

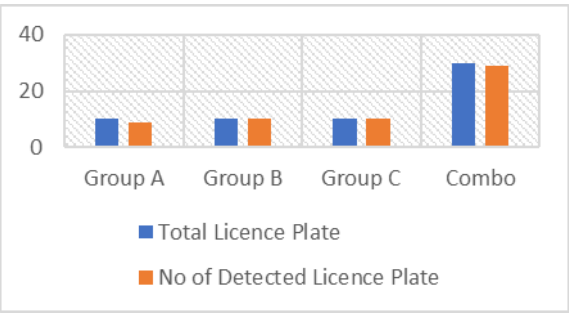


Chart -4: License Plate Detection through KNN

Table 1 shows the consequences of tag identification through Haar-training.[10] We can examination through the table that Group A has less discovery when contrasted with different gatherings yet recognition pace of haar-preparing for 3 gatherings is (0.96).

License Plate Detection Results through KNN

Results that we traversed KNN calculation we showed in the Table 2. Gathering A has lower recognition rate when contrasted with different gatherings however identification pace of KNN calculation against 3 gatherings is 0.86 which is very agreeable.

Precision of Tesseract-OCR

We utilized the KNN calculation and tesseract-ocr library with the blend for LPR.. The second segment contains those tags that were extricated in past segment utilizing KNN calculation.

Total Numbers of Extracted License Plates=26

Correct OCR Results=22

Precision of OCR= (22/26)*100= 84.6%

We can realize that the accuracy of tesseract-ocr results is just about 85 percent, which is very worthy. All in all, we see from the above outcomes that haar preparing calculation has higher discovery rate when contrasted with KNN calculation however KNN calculation likewise indicated great outcomes. Our experiments results for KNN likewise have given us that it has 85% precision for character acknowledgment. Since we will effectively compute the exactness of our License Plate Recognition framework. .[21]

Correct OCR Results=22

No. of License Plate used in test cases=30

Precision of LRP System= (22/30)*100= 73%

The calculation shows that the precision of our License Plate Recognition system is 73%.

License Plate Recognition in Practice, Real Time

We have picked 20 autos from rurak territory having standard Foreign tags and test our tag acknowledgment application.[11] We have tried to find that what number of attempts it expected to perceive tag. We have given greatest 3 attempts to perceive tag.

Total No. of Cars=20

Detected License Plates=17

Precision of LPR in Real Time= (17/20)*100=85%

The calculation shows that the precision of our LPR system in real time is 85%.

5.3 Smart Helmet Bike Starter with Alcohol Detection

According to study result, most instances of mishaps are cause by engine bicycles because of alcoholic and driving. It's mostly because of the nonappearance of head protector and the alcoholic and drive.[3] In our proposed framework we have an answer for build up an electronic brilliant cap framework that effectively checks the wearing of cap and tanked driving.[15] By executing this framework progressively for riders a sheltered excursion was guaranteed and a few passing because of the bike mishaps can be maintained a strategic distance from .[20] We have an answer for present propelled sensors procedures and radio recurrence remote correspondences are remembered for this undertaking to make it a decent one. [12] This task guarantees whether the individual wearing

head protector and maintaining a strategic distance from the tanked driving. By effectively executing this undertaking continuously a protected bike venture is conceivable and it lessen the wounds that were abstained from during the mishaps.

6. CONCLUSION

The proposed framework is to deliver an answer for one of the significant reasons for the street mishap, the driver laziness; .[22] the proposed arrangement does following the driver's face and eyes and afterward the framework will tell him when his eyes get shut so as to abstain from losing the control of the vehicle and causing auto collisions.

Continuous number plate location and acknowledgment framework that permits to "read" permit place data in a computerized way and perceive tag data with an exactness of over 70%, basically in a flash by essentially pointing and recognizing the gadget at a car.[16] Our first and principle objective is to build up a LPR framework that ought to have accuracy over 70%. We have tried rightness of our framework against pictures put away in database and constant .The outcomes from contextual analysis part show that exactness of LPR framework utilizing pictures from the continuous database is 73 % which is very agreeable. The constant testing shows that exactness of our LPR framework is 85%. the outcomes shows that haar-preparing has better location rate (96%) when contrasted with KNN calculation (83%) however the measurements of KNN calculation in Table 2 likewise show that discovery pace of this calculation isn't terrible. Other goal was to utilize standard libraries, so we utilized tesseract-ocr for Optical Character Recognition and the outcomes from tests [13] in Table 1 show that it has 86% accuracy. By actualizing this the demise rate can be diminished in our country.[17] The head protector may not be a 100% lifeline yet at the same time it can the primary line of barrier for the rider in the event of a mishap to get shields the riders. .[20]

The created venture proficiently guarantees:

- Ensuring rider is wearing protective cap all through the ride.
- Rider ought not be affected by liquor.
- Accident location.

7. FUTURE WORKS

Currently our LPR framework is utilizing KNN calculation for tag extraction. We can utilize KNN-preparing calculation rather than this calculation as results from contextual investigation shows that it has better discovery rate. We are utilizing nearby framework database for information stockpiling. For testing execution of remote information base server can be utilized through web administrations. It can be utilized in he genuine world by making it into the littler size. It can be utilized in four wheeler to guarantee the security of the driver.

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