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HELMET DETECTION FOR TRAFFIC RULES USING RASPBERRY PI AND IMAGE PROCESSING

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ABSTRACT

The rate of increase in the number of two-wheelers in India is 20 times faster than the rate of increase in the human population. Riders who do not wear a helmet have a 2.5-fold increased risk of fatality compared to those who do. The current video surveillance-based system is effective, but it requires a lot of human intervention, which reduces its efficiency over time and introduces human bias. This project tries to address this issue by automating the process of detecting motorcyclists who are not wearing helmets while riding. The system detects moving objects in the scene using a video of traffic on public highways as input. To determine whether the moving object is a two-wheeler, a machine learning classifier is applied to it. If the rider is on a two-wheeler, a different classifier is employed to determine whether or not the rider is wearing a helmet.

As a result, wearing protective headgear is crucial to reducing the risk of injury in the event of an accident. This project offers a mechanism for locating individual or several riders who are riding motorcycles without helmets. Bike riders are identified with the use of the YOLOv3 model, which is a consistent type of YOLO model, from the starting stage of the proposed approach. The frontline methodology for object distinguishing aids as such in identifying the riders with and without helmet. If the number of riders reaches two, the vertical projection of a binary picture is utilized to count them. Along with this speed and drowsiness added. A message module is sent to over speed and for drowsiness alarm is produced in inactive mode.

Keywords: Raspberry Pi, OpenCv, Python

I. INTRODUCTION

In practically every country, the two-wheeler is a common means of transportation. However, because of the lack of protection, there is a considerable risk. It is highly recommended that bike riders use helmets to lessen the risk associated.

Two-wheelers are the most common cause of traffic accidents. Though reckless and rash driving is the primary cause of these incidents, head injuries are the leading cause of fatalities. According to research, more than one-third of those killed in car accidents could have lived if they had worn a helmet. Helmet use can reduce accident deaths by 30 to 40%.

The number of motorcycle accidents caused by riders who do not wear helmets has been frightening. According to a Delhi Police annual report (published in 2017), 35-40% of fatal accidents in the city in 2016 were caused by riders "not wearing helmets" or "using helmets of inadequate quality. According to the Section of the 129 Motor Vehicles Act of 1988 makes that it mandatory for two-wheeler riders to wear safety helmets. A helmet should also have a thickness of 20-25 mm and high-quality foam, according to the guideline. It also should be ISI-certified and adhere to Bureau of Indian Standards.

With the fast speed of life and work, people have begun to compromise on the most important item they require to function effectively in a given scenario, namely, appropriate rest and sleep to stay active while performing a task. Drowsy driving is a highly dangerous phenomenon that has previously resulted in numerous accidents. According to certain studies, approximately 1200 people died and 76000 people were seriously injured as a result of a fatigued driver who caused a crash. We can avert significant traffic accidents by using current technology and real-time scanning systems with cameras to inform car drivers who are feeling drowsy through a drowsiness detection system. The goal of this project is to create a working prototype of a sleepiness detecting system. The focus will be on a framework that can continuously detect whether the driver's eyes are open or closed. It has been discovered that by focusing on the eyes, the onset of driver weariness can be detected in order to avoid an automobile accident. Drowsiness is detected using eye movements and the time between blinks to give a score that determines whether or not a motorist is drowsy.

II .LITERATURE SURVEY

Dahiyaetal. [2] used real-time videos to detect two-wheeler riders without helmets and implemented (HOG) Histogram of Oriented Gradients, (SIFT) Scale invariant feature transform, and (LBP) Local binary pattern. The detection accuracy was 93.80% with this technique, although the time interval required was slow at 11.58 frames per second [2]. It provides a two-level approach for detecting motorbike riders who are not wearing helmets in real time. A motorcycle rider is spotted within the video frame in the first portion. The head of the motorbike rider is detected in the second phase, and it is checked whether the rider is wearing a helmet or not, in order to reduce incorrect predictions. Despite being less expensive than prior works, applying pre-processing algorithms such as HOG, SIFT, and SVM takes a long time, making the process slow. [12] discusses a few methods that are basically similar to the one presented in this research, differentiates bike riders who do not wear helmets, and captures the plate of a large number of guilty parties on a COCO database. It uses YOLO to distinguish engine bikes and helmets, and Open ALPR is hence the technology used for licence plate recognition.

Both of these technologies have monthly costs and hence are not cost-effective. Chiverton et al. [16] advocated dividing motorbike riders using a foundation deduction technique followed by classification using Support Vector Machine (SVM) in a rush hour congestion video. For security helmet detection, Li et al [3] used Histogram of Oriented Gradients (HOG) based absolutely including extraction finalised SVM. Although it produced good results, the detection accuracy and speed were both slow. Due to the unique depth of light, the classifier occasionally produced incorrect effects, which had to be adjusted.

Silvaetal.[7] present a local Binary Pattern based cross breed descriptor for feature extraction. For robotized distinguishing proof of helmet-less motorcyclists, they used HOG and Hough Transform descriptors. However, the outcomes were slower than expected. Over the last few decades, some deceptive tactics like as computer vision and artificial intelligence (AI) have been widely used in smart observation at power substations. It can not only keep a strategic distance from boring work elevated assignments, but it can also keep a strategic distance from office equipment issues and professional illegal activity in time and exactly against disasters [3]. Rapid vehicles do not show up clearly in outlines in traffic videos captured by observation cameras during rush hour. As a result, locating quick motorcycles in a continuous observation film may be tough. The identification process is further complicated by the diverse shapes, colours, and sizes of motorcycles [1]. In order to distinguish defaulters, a solid mechanism is required. The above studies are mostly concerned with power equipment defect detection and state recognition. Intelligent surveillance systems must still monitor operator safety work in addition to equipment safety. Real-time detection of perambulatory employees wearing safety helmets, which is a common safe operation circumstance in power substations, is a critical duty for worker safety. As a result, a technology for automatically detecting power substations wearing safety helmets is required. Unfortunately, little research has been done in this area, with the majority of efforts focused on detecting motorcyclists wearing or not wearing helmets.

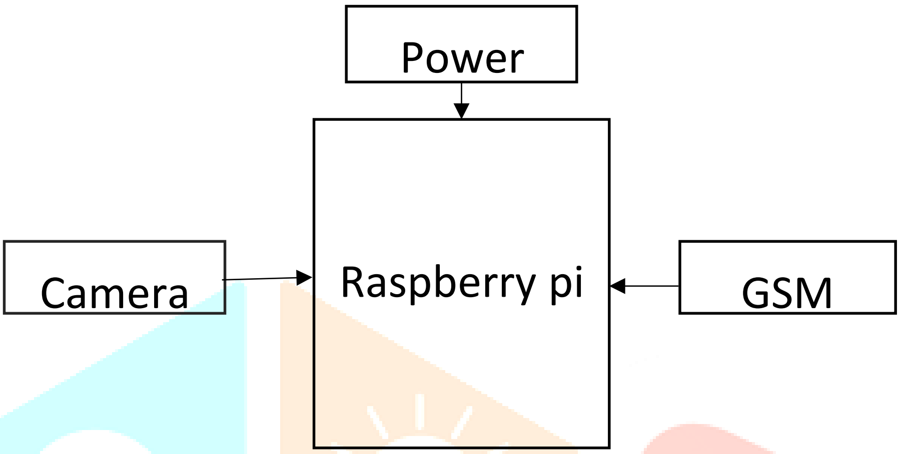
Wenetal [18] proposed a Hough transform-based circle arc identification algorithm. They used it to detect the presence of a helmet on an Automatic Teller Machine's surveillance system. However, this technique had one flaw: it relied solely on geometric cues to detect the presence of a helmet. Geometric traits alone are insufficient to detect the presence of a helmet; the head is frequently confused with the helmet. Chiu et al. employed a computer vision system to detect and segment motorcyclists that are partially obscured by another vehicle. A helmet detecting system was used, where the presence of a helmet indicates that a motorcycle is there. The edges of the helmet were computed in this paper to detect them at the possible region of helmet.

III. EXISTING SYSTEM

In the existing system they were using harr cascade algorithm for helmet detection purpose

Drawbacks

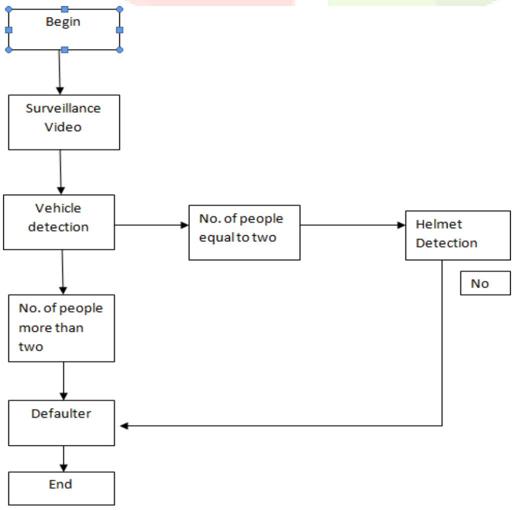
- Manual detection, no challan generation,
- No message module for speed detection and drowsiness detection.



IV. PROPOSED SYSTEM

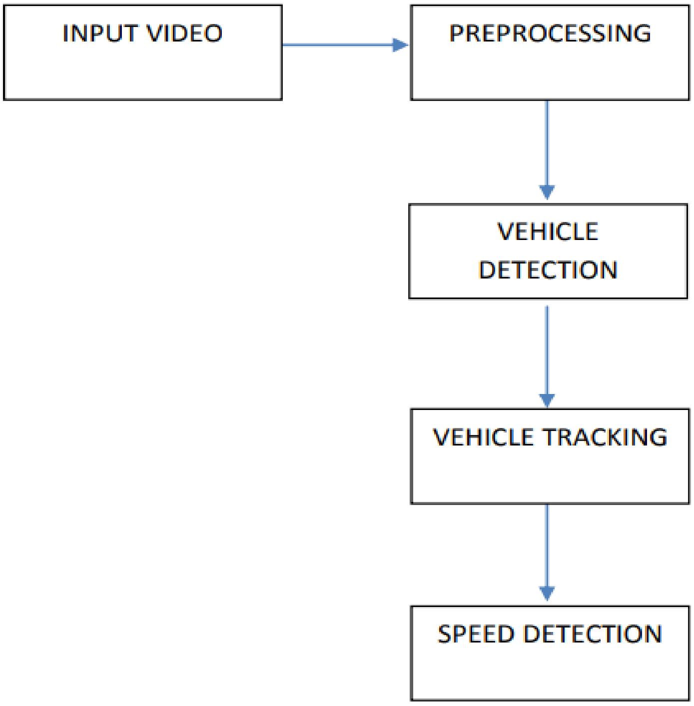
4.1 HELMET DETECTION

In this research, YOLOv3 computes an attempt to do image grouping to analyze the information dataset regarding motorcyclists wearing helmets or not. Furthermore, a deep learning strategy for picture identification to attempt to find a rider by not having helmet detection from the video picture.



4.2 VEHICLE SPEED DETECTION

The block diagram below shows how a video is first sent into the system as an input. The specified input video is initially pre-processed in accordance with the specifications. The car is recognised using the filters from the processed video sample. The speed of this vehicle is then determined by tracking and analysing it.



4.3 DRIVER DROWSINESS DETECTION:

A person's drowsiness can be assessed by the length of time that his or her eyelids are closed.The major focus of our system is on quicker data detection and processing. The number of frames in which the eyes are closed is tracked. If the number of frames reaches a specified threshold, a warning message appears on the display, indicating that the driver is sleepy. In our method, the picture is initially captured by the webcam and then processed. Then, in each and every frame, we utilize the Haar-cascade file face.xml to search for and detect faces.

If no faces are identified, another frame is obtained. If a face is discovered, a zone of interest inside the face is indicated. The eyeballs are located in this area of interest. Defining a region of interest considerably minimizes the system's computing requirements. The eyeballs are then identified from the region of interest using Haar-cascade eye.xml. If an eye is spotted, no blink occurs, and the blink counter K is set to '0.' When the eyelids are closed in a certain frame, the blink counter is incremented and a blink is recognized. When the driver's eyes are closed for more than four frames, it is obvious that he or she is sleepy. As a result, sleepiness is identified and an alert is triggered. The process is then repeated.

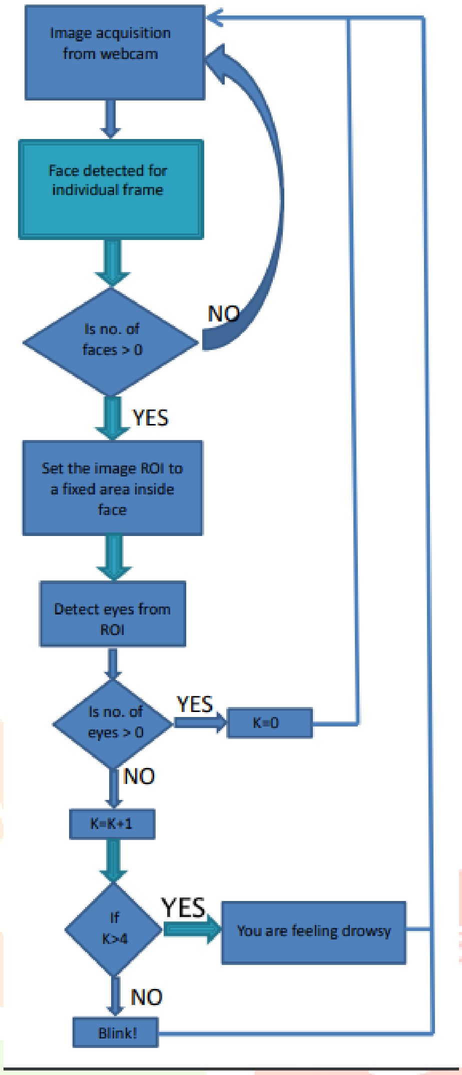
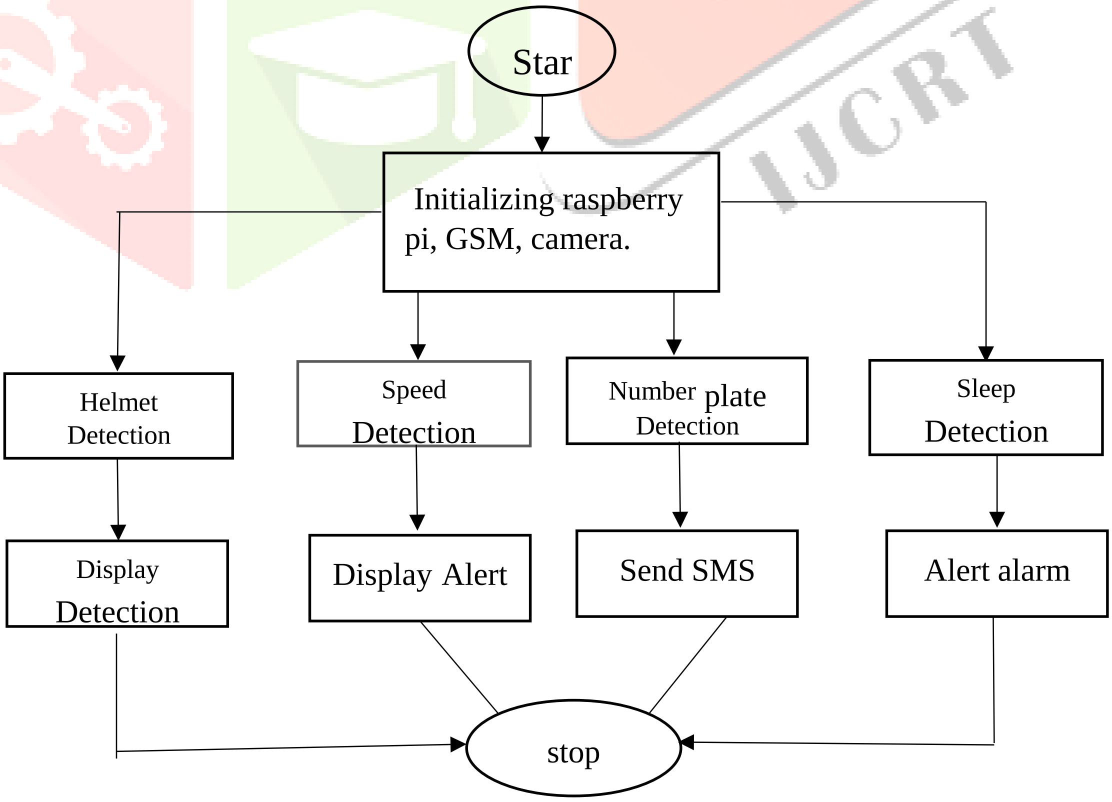


Image acquisition from webcam
Face detected for individual frame
Is no. of faces > 0
NO
YES
Set the image ROI to a fixed area inside face
Detect eyes from ROI
Is no. of eyes > 0
YES
K=0
NO
K=K+1
If K>4
YES
You are feeling drowsy
NO
Blink!


Star
Initializing raspberry pi, GSM, camera.
Helmet Detection
Speed Detection
Number plate Detection
Sleep Detection
Display Detection
Display Alert
Send SMS
Alert alarm
stop

V.Advantages:

- This system can automatically detect helmet.
- The system will also send the SMS whenever there is no helmet detection.
- It can also able to detect the sleep detection and alerting.
- This system can detect the speed detection.
- The system is fast and accurate.

VI.CONCLUSION :

A system is proposed in this project for the continuous identification of traffic rule violators who ride motorcycles without helmets and also defaulters who speed and drowsiness on the vehicle The Kalman filter method, we believe, is capable of accurately calculating the speed of a moving vehicle. For precise portrayal of moving objects, a Gaussian mix model was used in conjunction with this technique. Even when the visual quality is poor, the combination of optical stream and Kalman channel aids in predicting the results. We hope to develop the DBSCAN division in future research in order to distinguish

The system includes license plate detection, which will assist traffic cops in automatically detecting defaulters and giving them a challan through SMS. This would not only reduce the workload of traffic cops, but it will also be more convenient in every way. This system is also used for detecting over speed and sending SMS to the who cross the limit and also used for real time drowsiness detection.

VII.FUTURE SCOPE :

We can employ Automatic number-plate recognition for the purpose of license plate recognition (ANPR). It is a technique that reads vehicle registration plates using optical character recognition on photos to provide vehicle location data. It can leverage existing closed-circuit television, traffic enforcement cameras, or cameras created particularly for the job. ANPR is utilized by police agencies all around the world to check if a vehicle is registered or licensed, among other things.

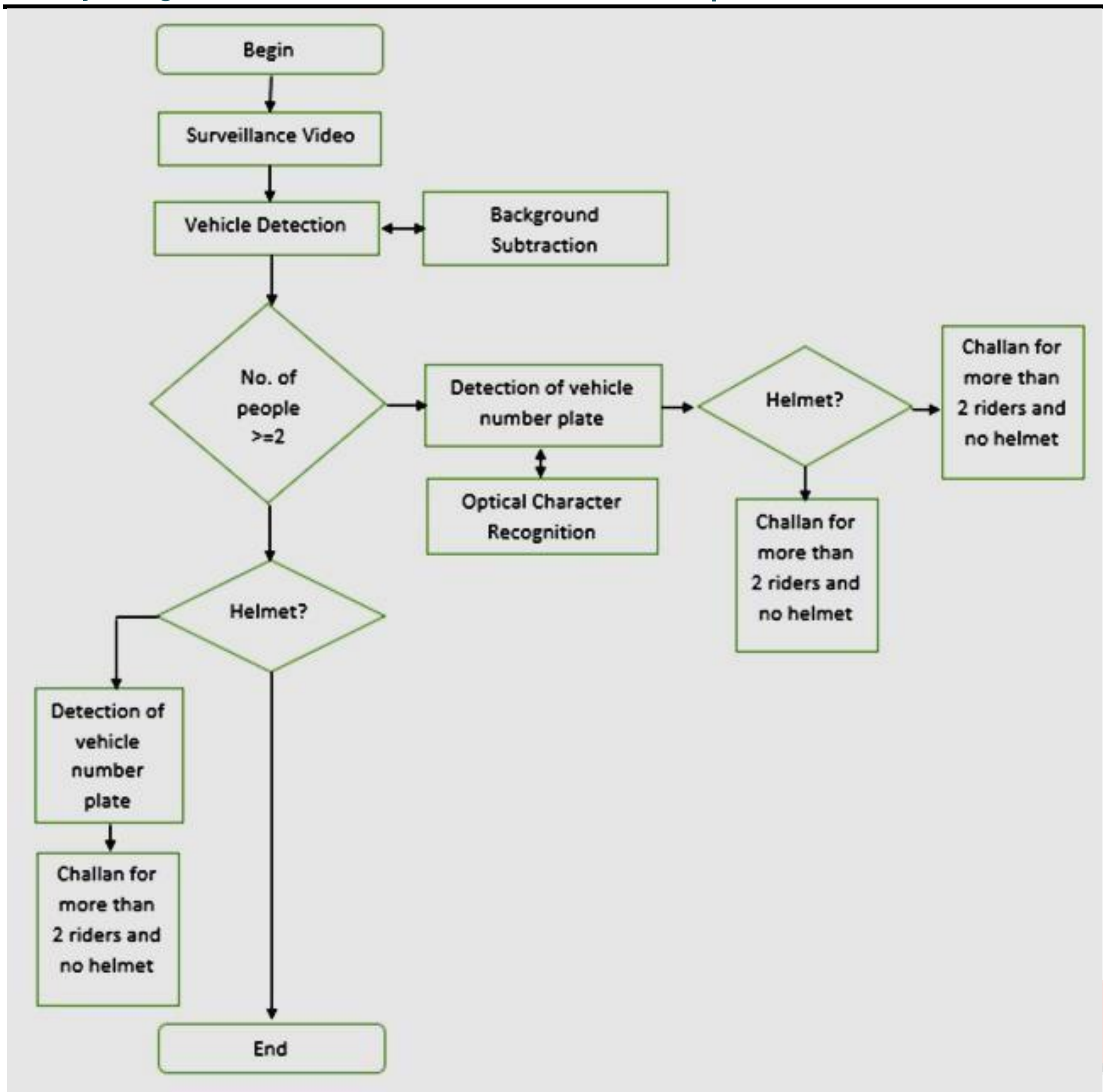


Figure: Block diagram for future scope

It's also utilized by transportation agencies for electronic toll collection on pay-per-use roadways and as a technique of cataloguing traffic movements.

Once the license plate number has been recognized and saved in a database. Cooperating with the local traffic agency can provide immediate access to license plate information. We can host a SQL-based online application that can create fines based on the defaults and then produce a text to send straight to the defaulter once we have the defaulter's information.

When fully implemented, the solution presented in this project would eliminate the need for human intervention in the process of detecting and fining traffic rule offenders. It can also be decentralized by incorporating an embedded technology into security cameras that detects and sends the fine amount directly to traffic rule offenders.

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