DROWSINESS DETECTION USING COMPUTER VISION

M.THIRUNAVUKKARASU [1], GADE VIJAY KUMAR REDDY[2], GADE SAI AJEETH REDDY[3]

[1]Assistant Professor, Computer Science and Engineering, SCSVMV, Kanchipuram
[2]B.E Graduate (IV year), Computer Science and Engineering, SCSVMV, Kanchipuram
[2]B.E Graduate (IV year), Computer Science and Engineering, SCSVMV, Kanchipuram

---

Abstract: - *The new manner of security system which can be mentioned during this project relies on machine learning and computer science. traveler security is that the main concern of the vehicle's designers wherever most of the accidents square measure caused because of somnolence Associate in Nursingd worn-out driving so as to supply higher security for saving lives of passengers airbag square measure designed however this methodology is helpful when Associate in Nursing accident is an accord. however the most downside remains we tend to see several accidents happening and plenty of of them square measure losing their lives. during this project we tend to square measure exploitation the OpenCV library for image process Associate in Nursingd giving input as user live video and coaching knowledge to discover if the person within the video is closing eyes or showing any symptoms of somnolence and fatigue then the applying can verify with trained knowledge and discover somnolence and lift an alarm which can alert the driving force and his family.*

Key Words*: *Drowsiness detection, Prevention, OpenCV, Computer vision, Real-time face recognition method, Smtplib & sms alert.

1.INTRODUCTION

HUMAN PSYCHOLOGY WITH CURRENT TECHNOLOGY

Humans have unceasingly made-up machines and devised techniques to ease and protect their lives, for mundane activities like traveling to work, or for tons of attention-grabbing functions like craft travel. With the advancement in technology, modes of transportation unbroken on advancing and our dependency thereon started increasing exponentially. It's greatly affected our lives as we tend to all understand it. Now, we'll jaunt places at a pace that even our grandparents wouldn't have thought getable. In times, nearly everyone throughout this world uses some reasonably transportation daily. Some people unit of measurement affluent enough to possess their own vehicles whereas others use public transportation. However, there unit of measurement some rules and codes of conduct for those who drive despite their rank. one in each of them is staying alert and active whereas driving. Neglecting our duties towards safer travel has enabled several thousands of tragedies to induce associated with this wonderful invention each year. it's planning to appear to be a trivial issue to most of the people but following rules and laws on the road is of utmost importance. whereas on road, Associate in Nursing automobile wields the foremost power and in loose hands, it's going to be harmful and usually, that carelessness can hurt lives even of the oldsters on the road. One moderately carelessness is not admitting when we tend to unit of measurement too tired to drive. thus on observe and forestall a harmful outcome from such negligence, many analysisers have written analysis papers on driver drowsiness detection systems. but sometimes, variety of the points and observations created by the system do not appear to be correct enough. Hence, to provide info and another perspective on the matter at hand, thus on boost their implementations and to any optimize the solution, this project has been done.

1.1 Scope of the project:

There live several merchandise out there that offer the measure of fatiguelevel within the drivers that square measure enforced in several vehicles. the motive force temporary state detection system provides the similar practicality however with higher results and extra advantages. Also, it alerts the user on reaching an explicit saturation of the temporary state live.

1.2 Literature Survey:

Driver's Drowsiness and Fatigue Detection

Traffic accidents continually cause nice material and human losses. one in every of the foremost necessary causes of those accidents is that the human issue, that is typically caused by fatigue or temporary state. to handle this drawback, many approaches were planned to predict the driving force state. Some solutions area unit supported the activity of the driving force behavior such as: the top movement, the period of the blink of the attention, the observation of the mouth expression. ... etc., whereas the others area unit supported the measurements of the physiological signals to induce data regarding the inner state of the driver's body. These measurements area unit Collected victimization totally different sensors like lectrocardiogram(ECG), Electromyography(EMG), Electroencephalography(EEG) and Electrooculogram (EOG). during this paper, we tend to bestowed a literature review on the recent connected works during this field. additionally, we tend to compared the strategies employed in every activity approach. Finally, a close discussion in line with the strategies potency likewise because the achieved results are going to be given.

Real-Time Driver's Drowsiness Monitoring Based on Dynamically

Varying Threshold

One of the foremost prevailing issues across the world today is that the booming range of road accidents. Improper and inattentive driving is one in every of the main reason for road accidents. Driver's somnolence or lack of concentration is taken into account as a dominant reason for such mishaps. analysis within the field of driver somnolence observation could facilitate to scale back the accidents. This paper thus proposes a non- intrusive approach for implementing a driver's somnolence alert system which might notice and monitor the yawning and temporary state of the motive force. The system uses bar graph minded Gradient (HOG) feature descriptor for face detection and facial points recognition. Then SVM is employed to see whether or not detected object is face or non- face. It any monitors the attention ratio (EAR) and Mouth ratio (MAR) of the motive force up to a set range of frames to see the temporary state and yawning. Since the somnolence or weariness of the motive force is additionally supported the range of hours he or she has been driving, a further feature of varied the edge frames for eyes and mouth is enclosed. This makes the system additional sensitive towards somnolence detection. Also, this needs the inclusion of face recognition implementation so observation will be done on an individual basis for each driver. Our experimental results shows that our projected framework perform well.

Unobtrusive Driver Drowsiness Prediction Using Driving Behavior from Vehicular Sensors

Falling asleep is an ultimate results of sleepiness, whereas driving it would even be a explanation for major disasters. Driver's oblivious try of driving a vehicle once they ar drowsy can result in critical accidents and even fatality. during this paper, we have a tendency to developed a framework to capture the sleepiness state of the driving force mistreatment vehicle measures in an unassertive method. A well experimented VR-based simulated driving atmosphere was utilized to watch the driver's sleepiness supported the acceleration, braking, and wheel axis pattern of the vehicle, in cycle with the self-estimated rating from the topic mistreatment KSS (Karolinska drowsiness Scale). we have a tendency to projected 2 prediction models to accomplish the sleepiness detection. We have a tendency to used the Classification in addition the Regression techniques that made a most accuracy rate of 99.10% and a minimum error rate of 0.34 RMSE. It absolutely was evaluated, supported its performance through the Ensemble classifier and Decision-Tree algorithms. As a result, it's known that a system designed mistreatment the Decision-Tree with the projected segmentation of four sec window, may verify the driver's sleepiness at the earliest of 4.4 sec within the Classification and 4.5 sec with Regression severally.

2. PROJECT DESCRIPTION:

The new manner of security system which can be mentioned during this project relies on machine learning and computer science. traveler security is that the main concern of the vehicle's designers wherever most of the accidents square measure caused because of somnolence Associate in Nursingd worn-out driving so as to supply higher security for saving lives of passengers airbag square measure designed however this methodology is helpful when Associate in Nursing accident is an accord. However the most downside remains we tend to see several accidents happening and plenty of of them square measure losing their lives. during this project we tend to square measure exploitation the OpenCV library for image process Associate in Nursingd giving input as user live video and coaching knowledge to discover if the person within the video is closing eyes or showing any symptoms of somnolence and fatigue then the applying can verify with trained knowledge and discover somnolence and lift an alarm which can alert the driving force and his family.

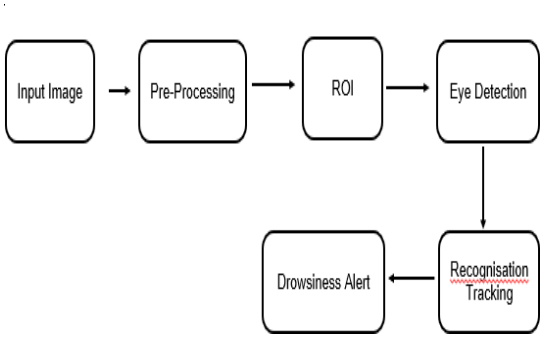
Problem Statement:

Fatigue may be a safety drawback that has not nevertheless been deeply tackled by any country within the world principally due to its nature. Fatigue, in general, is extremely troublesome to live or observe not like alcohol and medicines, which have clear key indicators and tests that square measure on the market simply. Probably, the simplest solutions to the present drawback square measure awareness regarding fatigue-related accidents and promoting drivers to admit fatigue once required. the previous is difficult and far costlier to attain, and therefore the latter isn't potential while not the previous as driving for long hours is extremely profitable.

Existing System:

Day by day there's nice improvement on chip in recent years; an outsized, 2D image may be simply method by a these chip. To method this image, the MATLAB may be used. The image analysis techniques victimisation MATLAB are greatly accepted and applied. However downside once it'll work on real time video bit stream or frames of pictures from video, it takes terribly long time interval to method these pictures and therefore system will fail with real time. the answer of this long time interval is planned during this paper. Figure one shows vision primarily based driver alertness system structure. Figure a pair of shows the flow chart of the complete method analyzing whether or not a warning ought to be signaled. The planned style is implementing with the assistance of OpenCV. Microsoft Visual Studio specific Edition 2008 is that the plat type to be used for OpenCV library. First, the system obtains pictures from video bit stream of driver's face by an imaging system i.e. CCD camera or camera, that is put in on the dashboard before of the motive force. Then the noninheritable face is cropped to locating solely eye. By decisive the attention space for every

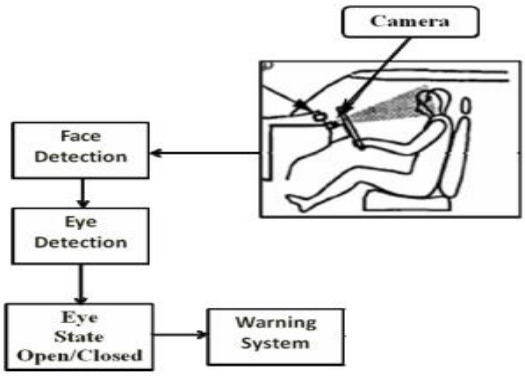
image, the primary face is detected then the higher and lower eyelids ar extracted. victimisation palpebra, the system detects eye-blinks i.e. eye gap and shutting of the motive force. Finally, victimisation the eye-blink data, the system presumes what quantity somnolence the motive force is felling. Vision primarily based Driver Alertness System Vision Based Driver Alertness System



Proposed Method:

To trot out this downside and supply an efficient system a sleepiness discoverion system will be developed which may be placed within associate degreey vehicle can which is able to take live video of the driving force as input and compare with coaching knowledge and if the driving force is showing any symptoms of sleepiness system will mechanically detect and lift an alarm which is able to alert the driving force, family and alternative passengers.

Algorithm:



Face Detection: For the face Detection it uses Haar feature-based cascade classifiers could be a smart object detection methodology. it is a machine learning primarily based approach where a cascade operate is trained from many positive and negative images. It's then used to discover objects in numerous photos. Here we'll work with face detection. Initially, the rule needs many positive pictures(images of faces) and negative pictures (images whereas not faces) to educate the classifier. Then weneed to extract choices from it.For this, Haar choices shown at intervals the below image area unit used. Theyare a small amount like our convolutional kernel. each feature is also one price obtained by subtractingsum of pixels below the white quadrangle from total of pixels below the black quadrangle represents five haar like choices & example. A cascaded Adaboost classifier with the Haar-like choices is exploited to go looking out out the faceregion. First, the salaried image is split into numbers of quadrangle areas, at any position and scale among the initial image. owing to the excellence of facial feature, Haar-likefeature is economical for amount of your time face detection. These is also calculated keep with the excellence of total of constituent values among quadrangle areas. the choices is also drawn by the different composition of the black region and white region. A cascaded Adaboost classifier is also astrong classifier that's a mix of the many weak classifiers. each weak classifier is trained by Adaboost rule. If a candidate sample passes through the cascaded Adaboost classifier, the face region is also found. Most of face samples can converge with and nonfacesamples is also rejected.

Eye detection:

In the system we've got used facial landmark prediction for eye Detection Facial landmarks are wont to localize and represent salient regions of the face, such as:

Eyes, Eyebrows, Nose, Mouth, Jawline.

Facial landmarks are with success applied to face alignment, head cause estimation, faces wapping, blink detection and far a lot of. Within the context of facial landmarks, our goal is detecting vital facial structures on the face exploitation form prediction ways. Detectingfacial landmarks is therefore a twostep process:

Localize the face within the image. Detect the key facial structures on the face ROI. Localize the face within the image.

The face image is localized by Haar feature-based cascade classifiers that was mentioned within the opening move of our algorithmic program i.e. face detection.Detect t he key facial structures on the face ROI:

There are a range of facial landmark detectors, however all ways basically attempt to localize and label the subsequent facial regions Mouth, Right eye brow, Left eye brow, Right eye, Left eye, Nose.

The facial landmark detector enclosed within the dlib library is an implementation of the One Millisecond Face Alignment with an Ensemble of Regression Trees paper by Kazemi and Sullivan (2014).

This technique starts by using:

1.A training set of labelled facial landmarks on a picture. These images ar manuallylabeled, specifying specific (x, y)-coordinates of regions surrounding every facialstructure.

Priors, of a lot of specifically, the likelihood on distance between pairs of input pixels.The pre-trained facial landmark detector within the dlib library is employed to

estimate the locationof 68 (x, y)-coordinates that map to facial structures on the face. we are able to sight and access each the attention region by the subsequent facial landmark index show below

The right eye exploitation [36, 42].

The left eye with [42, 48].

These annotations are a part of the sixty eight purpose iBUG 300-W dataset which the dlib facial landmark predictor was trained on. It's vital to notice that different flavors of facial landmark detectors exist, together with the 194 point model that may be trained on the helen dataset.

Regardless of that dataset is employed, constant dlib framework will be leveraged to coach ashape predictor on the input coaching information.

Recognition of Eye's State:

The eye space are often calculable from optical flow, by distributed trailing or by frame-to-frameintensity differencing and adaptational thresholding. And at last, a choice is created whether or not theeyes square measure or aren't coated by eyelids. a special approach is to infer the state of the eyeopening from one image, as e.g. by correlation matching with open and closed eyetemplates, a heuristic horizontal or vertical image intensity projection over the attention region, a constant quantity model fitting to search out the eyelids, or active form models. a significant downside of the previous approaches is that they sometimes implicitly impose too robust needs on the setup,in the sense of a relative face-camera create(head orientation),image resolution, illumination,

motion dynamics, etc. particularly the heuristic ways that use raw image intensity square measure likely to be terribly sensitive despite their real-time performance. Therefore, we have a tendency to propose an easy however efficient rule to notice eye blinks by using a recentfacial landmark detector. one scalar amount that reflects a level of the eye gap isderived from the landmarks. Finally, having a per-frame sequence of the eye-opening estimates, the eye blinks square measure found by an SVM classifier that's trained on samples of blinking and non- blinking patterns.

Eye Aspected magnitude relation Calculation:

For every video frame, the eye landmarks are detected. the attention magnitude relation (EAR) between height and dimension of the eye is computed.

EAR = ((P2-P6) + (P3-P5)) / 2(P1-P4)

where p1, . . ., p6 are the 2d landmark locations, represented in Fig. 1.The EAR is usually constant when an eye fixed is open and is obtaining near to zero whereas closing an eye fixed. it's part person and head create insensitive. Ratio of the open eye features a little variance among people, and it is absolutely invariant to a homogenous scaling of the image and in-plane rotation of the face. Since eye blinking is performed by each eyes synchronously, the EAR of each eyes is averaged.

Eye State Determination:

Finally, the choice for the attention state is created supported EAR calculated within the previous step. If the distance is zero or is near to zero, the attention state is assessed as "closed" otherwise the eyestate is known as "open".

Drowsiness Detection:

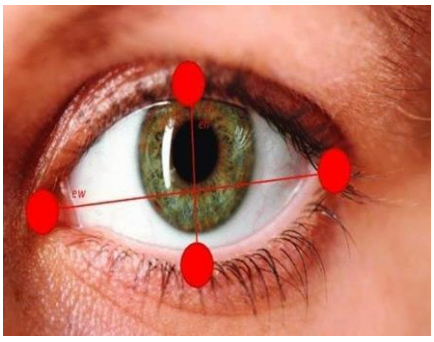
The last step of the algorithmic rule is to see the person's condition supported a pre-set condition for somnolence. the typical blink length of someone is 100-400 milliseconds (i.e. 0.1-0.4 ofa second). thus if someone is drowsy his eye closure should be on the far side this interval. we tend to set atime frame of five seconds. If the eyes stay closed for 5 or a lot of seconds, somnolence isdetected and alert pop concerning this can be triggered.

Process:

In our program we tend to used Dlib, a pre-trained program trained on the helen dataset to sight human faces exploitation the pre-defined sixty eight landmarks. once passing our video feed to the dlib frame by frame, we tend to ar able to sight left eye and right eye options of the face.

Now, we've a bent to Drew contours around it exploitation OpenCV.

• Exploitation Scipy's geometrician perform, we've a tendency to calculated total of every eyes' magnitude relation that is that the total of 2 distinct vertical distances between the eyelids divided by its horizontal distance.



Eyes with horizontal and vertical distance marked for Eye Aspect Ratio calculation. Now we check if the aspect ratio value is less than 0.25 (0.25 was chosen as a base case after some tests). If it is less an alarm is sounded and user is warned.

3. CONCLUSION:

The driver abnormality watching system developed is capable of detective work somnolence, sottish and reckless behaviours of driver in an exceedingly short time. The somnolence Detection System developed supported eye closure of the driver will differentiate normal eye blink and drowsiness and discover the drowsiness whereas driving. The planned system will stop the accidents because of the sleepiness whereas driving. The system works well even just in case of drivers carrying spectacles and even below low light conditions if the camera delivers higher output. Data concerning the head and eyes position is obtained through numerous self- developed image process algorithms. throughout the monitoring, the system is ready to make your mind up if the eyes are opened or closed. Once the eyes are closed for too long, a signal is issued. Process judges the driver's alertness level on the idea of continuous eye closures. closures.

The model are often improved incrementally by using different parameters like blink rate, yawning, state of the automobile, etc. If of these parameters are used it will improve the accuracy by a great deal. Same model and techniques are often used for numerous different uses like Netflix and different streaming services will discover once the user is asleep and stop the video consequently. It may be employed in application that forestalls user from sleeping.

REFERENCES

[1] Bill Fleming, "New Automotive Electronics Technologies", International Conference on Pattern Recognition, pp. 484-488, December 2017.

[2] Boon-Giin Lee and Wan-Young Chung, Member IEEE, "Driver Alertness Monitoring Using Fusion of Facial Features and Bio-Signals", IEEE Sensors Journal, VOL. 12, NO. 7, July 2019.

[3] H. Singh, J. S. Bhatia, and J. Kaur, "Eye tracking based driver fatigue monitoring and warning system", in Proc. IEEE IICPE, New Delhi, India, Jan. 2018.

[4] Ishii, T.; Hirose, M.; Iwata, H. Automatic recognition of driver's facial expression by image analysis. J. Soc. Automot. Eng. Jpn. 1987, 41, 1398–1403.

[5] Takchito, H.; Katsuya, M.; Kazunori, S.; Yuji, M. Detecting Drowsiness while Driving by Measuring Eye-Movement—A Polot Study. In Proceedings of the International Conference on Intelligent Transportation-Systems, Singapore, 3–6 September 2002.

[6] N.A. Abu Osman et al. (Eds.): BIOMED 2011, IFMBE Proceedings 35, pp. 308–311, 2011.

BIOGRAPHIES

1. Mr. M.Thirunavukkarasu is an Assistant Professor in Computer Science and Engineering at Sri Chandrasekharendra SaraswathiViswa Mahavidyalaya deemed to be university, Enathur, Kanchipuram, India.

2. Mr. Gade Vijay Kumar Reddy, Student, B.E. Computer Science and Engineering, Sri Chandrasekharendra SaraswathiViswa Mahavidyalaya deemed to be university, Enathur, Kanchipuram, India.

3. Mr. Gade Sai Ajeeth Reddy, Student, B.E. Computer Science and Engineering, Sri Chandrasekharendra SaraswathiViswa Mahavidyalaya deemed to be university, Enathur, Kanchipuram, India.