

Driver Drowsiness Detection System Using Histogram Oriented Gradient and Support Vector Machine

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ABSTRACT

Driver drowsiness detection is a car safety technology which prevents accidents when the driver is getting drowsy. The initial goal of this research was to utilize the retinal reflection to locate the eyes on the face, and then use the lack of this reflection to identify when the eyes are closed. Applying the algorithm on the consecutive video frames may aid in the calculation of eye closure period. Eye closure period for drowsy drivers are longer than normal blinking and warn the driver as soon as eye is closed is detected.. Drivers must maintain a careful eye on the road in order to respond quickly to unexpected incidents. Driver fatigue often becomes a direct cause of many traffic accidents. Therefore, there is a need to develop the systems that will detect and notify a driver of her/him bad psycho physical condition, which could significantly reduce the number of fatigue-related car accidents. SVM and HOG are used to find the drowsiness of the driver.

Keywords: Driver drowsiness, SVM, HOG,

I. INTRODUCTION

1.1 Historical Perspective

Many of the techniques of digital image processing, or digital picture processing as it often was called, were developed in the 1960s, at Bell Laboratories, the Jet Propulsion Laboratory, Massachusetts Institute of Technology, University of Maryland, and a few other research facilities, with application to satellite imagery, wire-photo standards conversion, medical imaging, videophone, character recognition, and photograph enhancement.

The purpose of early image processing was to improve the quality of the image. It was intended for humans to boost their visual impact. In image processing, the input is a low-quality picture, and the output is a higher-quality image. Image enhancement, restoration, encoding, Image processing includes and compression. First successful application was from JPL (JPL). They used image processing methods including geometry correction, gradient modification, noise

reduction, and so on to the hundreds of
Considering the sun's and moon's
positions, the Space Detector Ranger 7
returned lunar images in 1964.

1.2 OBJECTIVES

Driver fatigue is one of the main
reasons why accidents happen all over the
world. Detecting a motorist's drowsiness is
one of the most reliable approaches for
assessing driver fatigue. The purpose of
this Endeavour is to create a prototype
sleepiness detecting system.

This device operates by monitoring the
driver's eyes and raising an alert if he or
she becomes tired. In this method, a non-
intrusive real-time monitoring system is
developed.

The goal is to enhance driving safety
without being invasive. In this research,
the eye blink of the driver is monitored. If
the driver's eyelids stay closed for an
extended amount of time, he or she is
considered sleepy, and an alert is raised.

The programming is done in OpenCV
using the SVM package for face feature
detection.

1.3 OUTLINE OF THE PROJECT

The introduction and main
objectives of the project have been
discussed so far which brings us to the
conclusion that This project will build and
construct a Driver Drowsiness Detection

System using SVM and HOG.

In the second chapter we have
done the Literature Survey related to our
project i.e, Driver Drowsiness Detection
System. In the third chapter we have
discussed about the necessary gear and
software for the project. In the fourth
chapter we have discussed the working
principle of the projection using the block
diagram. In the fifth chapter we have
shown the results obtained by us during
the testing of the project.

II. LITERATURE SURVE

2008 saw the publication of "A Partial
Least Squares Regression-Based Fusion
Model for Predicting Drowsiness" [1].
They suggested a novel approach for
modeling driver drowsiness with various
eyelid movement variables, based on
partial least squares regression (PLSR), to
address significant collinear interactions
between eyelid movement features and
forecast sleepiness propensity.
Confirmation of the accuracy and
robustness of the model's predictions,
demonstrating that it offers a unique
means of combining many characteristics
together to improve our capacity to
identify and forecast sleepiness.

"Camera-based Drowsiness Reference for
Driver State Classification under Real
Driving Conditions" was published by Bin
Yang et al. In simulator or experiment

conditions, assessments of the driver's eyes may identify tiredness. Examining the most recent Using eye tracking, in-car technologies can tell if a driver is getting tired. These measures are scientifically assessed and categorized using a massive data set compiled from 90 hours of actual driving. Eye-tracking fatigue detection is effective for certain drivers if blink detection is accurate. There are still concerns with inadequate illumination especially for individuals who need glasses, despite the planned changes. In conclusion, camera-based sleepiness evaluations add substantially to a sleepiness reference, but not the only one.

2010 saw the presentation of "Drowsiness Warning System Using AI" [3]. Driving assistance systems like navigation systems help drivers in many ways. Driving assistance systems must measure driver awareness. Detecting driver tiredness might prevent sleepy-driving accidents. This research examines artificial sleepiness detection techniques. This system analyses faces to inform drivers of fatigue or inattention, therefore preventing traffic accidents.

B.Hariri Shervin Shirmohammadi. [4] described 'Driver sleepiness monitoring based on yawning detection' in May 2011. Driver fatigue and sleepiness are key causes of road accidents. In this study, we

describe a strategy for recognizing and notifying drivers who are drowsy. The goal is to minimize the frequency of accidents caused by driver weariness and so improve transportation safety. Many distinctive body and facial signals, such as yawning, eye exhaustion, and eye movement, are utilized as indicators of driver fatigue, indicating that The driver's condition is no longer fit for driving. We provide a technique for detecting yawning based on changes in the geometric characteristics of the mouth.

"A Dedicated System for Monitoring Driver Fatigue" was published in 2012 by K.Subhashini Spurjeon and Yogesh Bahindwar. This study gives a real-time way for analysing a driver's video sequences and attention. The suggested approach computes the Percent of Eyelid Closure (PERCLOS) as an indication of sleepiness. Driver fatigue and drowsiness are the major causes of motor vehicle accidents. A possible method for preventing accidents caused by driver factors is to monitor the driver's attentiveness and inform him or her when he or she isn't paying enough attention to the road. Visual data is collected using a specifically built technology that combines a CCD video camera with an infrared lighting system.

III. IMPLEMENTATION

3.1 PROPOSED BLOCK DIAGRAM

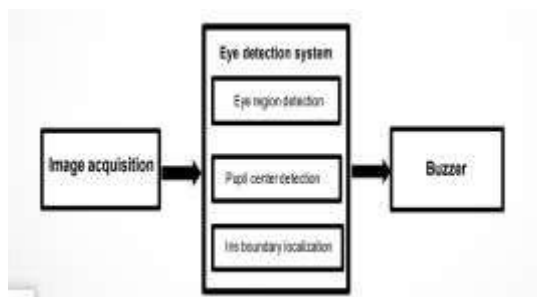


Fig 3.1: Block Diagram of Proposed System

3.2 WORKING PRINCIPLE

3.2.1 Image Acquisition

To access the front camera, the user must provide permission. When in portrait mode, it should be possible to change width and height sizes by rotating by 90 degrees during face movement. Camera hardware The camera should be able to generate at least four frames per second via the camera that the android Smartphone will access. During the night, near-infrared light may be employed to maintain the camera in ready mode to take the picture. The light sensitivity may range from 750 to 2000 nm. For this application, a camera with a frame rate of roughly 60 frames per second is employed to achieve great precision. The apps may even operate at four frames per second.

3.2.2 Face Detection System

Face movement detection is critical for recognizing the driver's facial expression in driving conditions. To validate the single face in the picture that

is close to the camera, an overlay must be created. Multiple faces cannot be detected during face movement detection.

These characteristics are often used to recognize the face and eye in captured picture classifiers are the difference between the total of pixels inside the rectangle at any size and position within the source picture.

3.3 Proposed Methodology

Here we are using SVM classification technique. SVM is a machine learning classification learning algorithm. We are using dlib library for facial landmarks to obtain the facial structures of the image and also We use a metric ratio known as Eye Aspect Ratio (EAR) to identify driver tiredness.

3.3.1 Face Detection

A camera is used to recognize the face in this case. The camera continues to observe the state of the driver's face. This is transformed into many frames. First, the face is identified using a method known as Histogram Oriented Gradient (HOG)

HOG is a computer vision and image processing approach for object identification (HOG). The approach focuses on the gradient orientation in certain areas of a picture. The distribution of edge orientations and edge intensities may be utilized to identify the local look and shape of an image's objects. The

picture is split into tiny linked sections called cells, and a histogram of each gradient direction may be created for the pixels in each cell. The histogram channels are uniformly distributed between 0 to 180 degrees or 0 to 360 degrees, depending on the gradient. To modify lighting and contrast locally, cells must be grouped into larger, physically related blocks. Rectangular and circular R-HOG blocks exist. HOG descriptors may identify objects in a machine learning system. In this case, we're utilizing R-HOG blocks to recognize the driver's face. HOG is used to characterize a particular area that requires additional processing.

SVM (Support Vector Machine) is used for classification and regression in supervised learning. Machine Learning uses it to solve Classification problems. SVM identifies the best line or decision boundary for categorizing n-dimensional space so following data points may be readily categorized. Hyper planes provide good choice boundaries. SVM picks hyper plane extreme points/vectors. Support vectors are extreme cases, and the SVM is the matching technology.

Drowsiness detection and eye detection: The eyes are identified from the face for additional processing to determine whether the driver is drowsy or not. In this case, we're focusing on distinguishing the eyes from the rest of the face. This proposed

system applies Real-time algorithm to identify eye blinks in video. Modern landmark detectors are very resilient against camera head movement, changeable lighting, and facial expressions. This research pinpoints indicators to measure eye opening. The suggested technique evaluates landmark locations and extracts an eye aspect ratio (EAR) variable to characterize each eye opening.

EAR recognizes eye opening and closure using landmarks. This landmark detector catches most facial characteristics. Eyes flicker when they quickly close and reopen. Everybody blinks differently. The pattern's tempo varies eye closure, squeeze, and blink duration. Eye blinks last 100-400 milliseconds. We estimate eye opening using the eye aspect ratio (EAR) from image landmarks. Each video frame has eye landmarks. The eye's height to width ratio is its aspect ratio. When an eye is open, the EAR is virtually constant, and when it is closed, it approaches zero. Because both eyes blink at the same time, the EAR of both eyes is taken and averaged.

If the EAR value is below the limit for two or three seconds after it is obtained, the driver is considered drowsy. The system-connected buzzer takes steps to remedy the driver's inappropriate conduct. Here if the eyes are closed blink counter is

incremented and if it is found that they are closed for more than certain no of frames it is deducible that driver is feeling drowsy and an alarm gets sounded.

IV. RESULTS

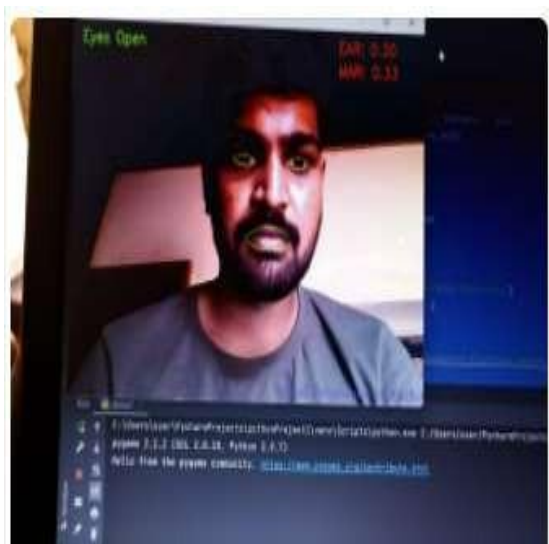


Fig 4.1: Eyes are open(EAR value decides drowsiness)



Fig.4.2 Eyes are open(EAR value decides drowsiness)

In above both images EAR value is greater than 0.25 which shows that driver is not in drowsiness .

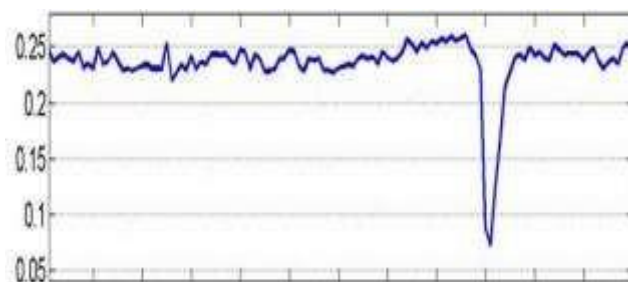


Fig 4.3: Above fig shows the EAR values when the eyes are closed and opened.

If the eye aspect ratio is less than 0.25 alerts is generated.

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