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Emotion Detection Using Machine Learning Technique

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ABSTRACT: Safe car driving has become a priority in everyday life. The main reason for designing a real time system which monitors the state of the driver's eyes is related to a decrease in car crashes that will benefit millions of people around the world. This work proposes a method to detect and to monitor the eyes of the driver, more precisely it analyses the eyes and check if they are closed or open. The number of frames in which eyes are closed is determined. When this number of frames is above a certain threshold, the driver will get a alert.The use of machines to perform different tasks is constantlyincreasing in societyProviding machines with perception can lead them toperform a great variety of tasks; even very complex ones such as elderly care.Machine perception requires that machines understand about their environmentand interlocutor's intention. Recognizing facial emotions might help in thisregard. During the development of this work, deep learning techniques havebeen used over images displaying the following facial emotions: happiness,sadness, anger, surprise, disgust, and fear. In this project, a pure Haar Cascade approach outperformed other statistical methods' resultsachieved by other authorsthat include feature engineering. UtilizingHaar Cascade involves feature learning;which sounds very promisingfor this task where defining features is not trivial. Haar cascade proves to be useful in detecting objects both in image and the video which is important for this project.Haar cascade which can be used in real time which proves to be for This project which is purely based on safeguarding the driver by focusing on the driver's eyes using a camera and the haar cascade which detect the drowsiness and the alert the driver through an buzzer by which an accident which can be prevented.

KEYWORDS: Facial Emotions;Haar cascade;Drowsiness

I. INTRODUCTION

Drowsy driving is one of the major causes of deaths occurring in road accidents. The truck drivers who drive for continuous long hours (especially at night), bus drivers of long distance route or overnight buses are more susceptible to this problem. Driver drowsiness is an overcast nightmare to passengers in every country. Every year, a large number of injuries and deaths occur due to fatigue related road accidents. Hence, detection of driver's fatigue and its indication is an active area of research due to its immense practical applicability. The basic drowsiness detection system has three blocks/modules; acquisition system, processing system and warning system. Here, the video of the driver's frontal face is captured in acquisition system and transferred to the processing block where it is processed online to detect drowsiness. Driver will get alert sound when drowsiness is detected.Many traffic accidents are caused by drivers falling asleep while driving. So it would be beneficial to develop a way to detect the drowsiness before it occurrence and to be able to warn the driver in time. Many systems have already been developed which are based on the vehicle behavior like steering wheel movements, focusing on the driver physical behavior i.e. based on recording of head movements, heart rate variability or grip strength. System uses a video camera for the tracking of eye movements have also been developed. Till now no system has proved to be sufficiently reliable.Haar cascade which can be used in real time which proves to be for This project which is purely based on safeguarding the driver by focusing on the driver's eyes using a camera and the haar cascade which detect the drowsiness and the alert the driver through an buzzer by which an accident which can be prevented.

II. RELATED WORK

In [2] authors useda drowsiness prevention device since recently vehicular count of accidents increases yearly in the Philippines. Current safety measures are followed to increase the driver's awareness which includes the use of standard rumble strips on roads reference, installation of GPS, speed limiters, sensors and other studies uses signal processing embedded of an expensive vehicle. The technology uses internet of things so that the vehicle owner can monitor the driver's drowsiness everywhere during work hours. The study focuses at the eyelid movement that is not yet mentioned

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to the previous study. This proposed system continuously scans the eyelid movements of the driver and once drowsiness is detected the device automatically alerts him using a random-typed alarm. It automatically forwards the report to the vehicle owner from the web application through internet access. The project received consistent results through evaluation and testing as it is 95% successfully detects and alerts a drowsy driver.[3].AuthorsUsed a novel approach for an intelligent driver drowsiness detection system using visual behavior of the driver. The estimation of driver's vigilance is successfully made by combining facial and eye symptoms using fuzzy logic controller. Experimental result using fuzzy-logic simulation in Matlab show the performance of the developed approach in term of robustness and reliability.In [4]A novel driver drowsiness detection method based on time series analysis of the steering wheel angular velocity is proposed in this paper. Firstly, the steering behavior under the fatigue state is analyzed, followed by the determination of the temporal detection window, and then, the data series of the steering wheel angular velocity in the temporal detection window is selected as the detection feature. IF the detection feature satisfies the extent constraint and the variability constraint in the temporal window, a drowsiness state is detected accordingly. At last, experiment tests validate our method has good performance and could be well used in the real world.In [5]Authorsproposes a novel drowsiness detection algorithm using a camera near the dashboard. The proposed algorithm detects the driver's face in the image and estimates the landmarks in the face region. In order to detect the face, the proposed algorithm uses an AdaBoost classifier based on the Modified Census Transform features. And the proposed algorithm uses regressing Local Binary Features for face landmark detection. Eye states (closed, open) is determined by the value of Eye Aspect Ratio which is easily calculated by the landmarks in eye region. The proposed algorithm provides realtime performance that can be run on the embedded device. We obtained the dataset using video records from the infrared camera which is used the real-field. The proposed algorithm tested in the target board (i.mx6q). The result shows that the proposed algorithm outperformed in the speed and accuracyIn [6] Authors A person when he or she does not have a proper rest especially a driver, tends to fall asleep causing a traffic accident. It is why the present work wants to realize a system that can detect the drowsiness of the driver, in order to reduce traffic accidents. For that system, it will take the processing of images through a camera which will focus on the driver. In that, it is going to analyze the changes that happen in the face and then will be processed through a program in order to detect drowsiness to send an alert to the driver.In [7] authors useddriver drowsiness detection algorithm based on the state of eyes of the driver which is determined by his iris visibility has been implemented. If eyes remain in one state either open or closed longer than expected time as well as if the driver is not looking straight front, it is an indication that driver is drowsy and then the system warns the driver. System is capable of detecting the state of eyes with or without the regular glasses. Matlab with image processing tools has been used to process the image provided by a camera. Matlab creates System Object using Viola_Jones algorithm to detect the objects such as nose, mouth or upper body. After capturing an image, rectangular eyes area was adjusted to reduce the noise. RGB to Gray scale and finally to Binary image conversion is with a suitable threshold value. A median filter was used to reduce the noise and then the image was smoothened.

III. PROPOSED ALGORITHM

A. *Design Considerations:*

- Operating system windows 10 is required.
- Haar cascade capable of detecting objects.
- Keeping track of previously used images.
- Arduino uno capable of receiving signal at 9600 baud rate.
- Buzzer should be activated whenever the module detect drowsiness.
- The time when drowsiness is detected the vibration motor turned off.

B. *Description of the Proposed Algorithm:*

Aim of the proposed algorithm is to detect drowsy eye of an user and alert him by an buzzer. The proposed algorithm is consists of four main steps.

Step 1: Calculating Haar Features

A Haar feature is essentially calculations that are performed on adjacent rectangular regions at a specific location in a detection window. The calculation involves summing the pixel intensities in each region and calculating the differences between the sums. Here are some examples of Haar features below.

Step 2: Creating Integral Images

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integral images essentially speed up the calculation of these Haar features. Instead of computing at every pixel, it instead creates sub-rectangles and creates array references for each of those sub-rectangles. These are then used to compute the Haar features.It's important to note that nearly all of the Haar features will be irrelevant when doing object detection, because the only features that are important are those of the object.

Step 3: Adaboost Training

Adaboost essentially chooses the best features and trains the classifiers to use them. It uses a combination of "weak classifiers" to create a "strong classifier" that the algorithm can use to detect objects.Weak learners are created by moving a window over the input image, and computing Haar features for each subsection of the image. This difference is compared to a learned threshold that separates non-objects from objects. Because these are "weak classifiers," a large number of Haar features is needed for accuracy to form a strong classifier.

Step 4 : Implementing Cascading Classifiers

The cascade classifier is made up of a series of stages, where each stage is a collection of weak learners. Weak learners are trained using boosting, which allows for a highly accurate classifier from the mean prediction of all weak learners.It's important to maximize a low false negative rate, because classifying an object as a non-object will severely impair your object detection algorithm. A video below shows Haar cascades in action. The red boxes denote "positives" from the weak learners.

IV. PSEUDO CODE

```
Step 1: Acquire new image from camera..
Step 2: Convert color of images to greyscale..
Step 3:  Detect faces using Cascade Classifier.
          If (Face detected)
             Detect eyes in face images
          Else
              Return to detect faces
          end
Step 4:  Detect eyes in face of images
           If (eyes detected)
               Normalize face images size and orientation.
           Else
                Return to detect face.
            End
Step 5: Contrast and lighting enchantments of the detected faces images
Step 6:  Detect drowsiness in eyes
           If (drowsiness detected)
              Alert the user
           Else
              Return to detect drowsiness in eyes.
           End
Step 7: End.
```

V. SIMULATION RESULTS

The haar cascade algorithm code is complied in the system which activates the system's camera since the haar cascade can be used in the real time purpose this proves useful for this module. The algorithm detects the eyes and emotions of the driver when the driver is normal or active when driving the vehicle the module generate the emotions of the driver. When the driver feels drowsiness and the moment he begins to close his eye the module detect the eyes and if the eyes remained closed after a couple of seconds the module detects the driver is sleepy and activates its alert system. This program is coded in the way its keeps running until the user stops, as a result the module constantly detects the eyes of the driver and also the emotions of the driver. Since module runs simultaneously its is easier for the module to detect the detect the drowsy eye of an driver and alert him through out the journey.This is how haar cascade algorithm helps in the detection of the drowsy eyes.The hardware module which consists of arduino uno, a buzzer and an vibration

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motor, the hardware module which is connected to the "COM4" of the system module, so when the system module detects the drowsiness the data which is sent to the "COM4" to the hardware module. The motor which is connected through the 7th pin and the buzzer which is connected to the 8th pin of the arduino uno. The motors stops which is an prototype brake system and the buzzer is activated whenever the system module detects the drowsy state of an driver.The system and hardware modules communicates through serial communication with an baud rate of 9600.The baud rate of 9600 means that the serial port is capable of transferring a maximum of 9600 bits per second. The module which continues to run until the user stops the system or software module.

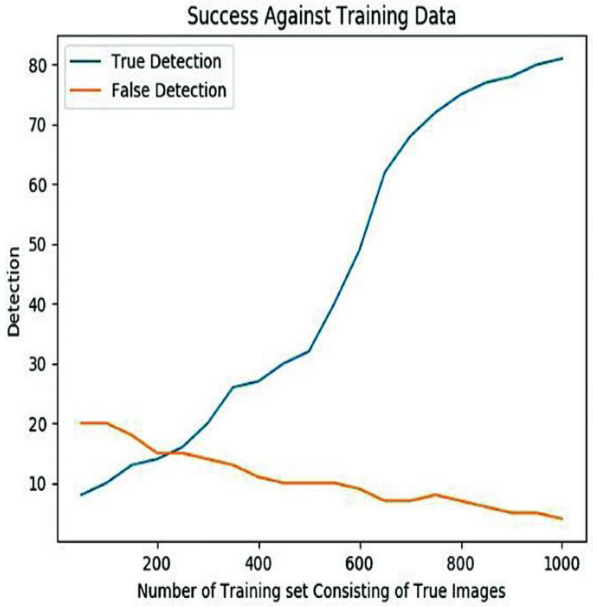

Fig 1: Success Against Training Data.

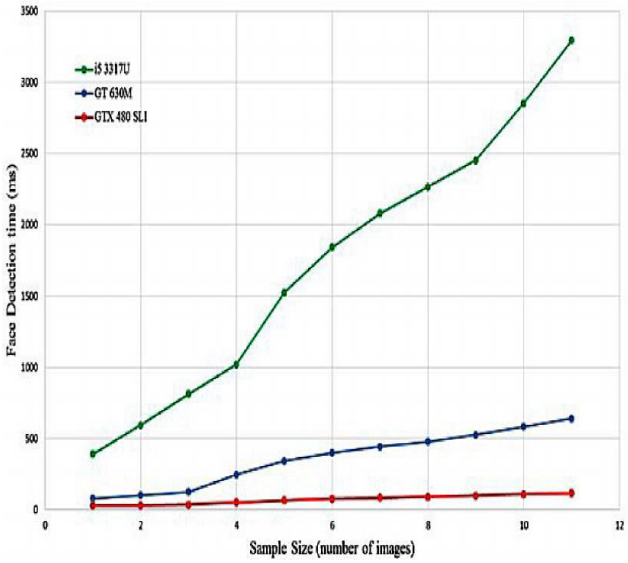

Fig 2: Image processing speed of different processor.

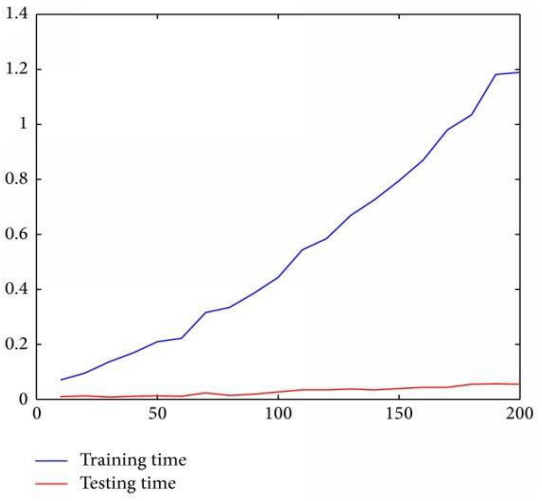

Fig 3:Training time Against Testing Time.

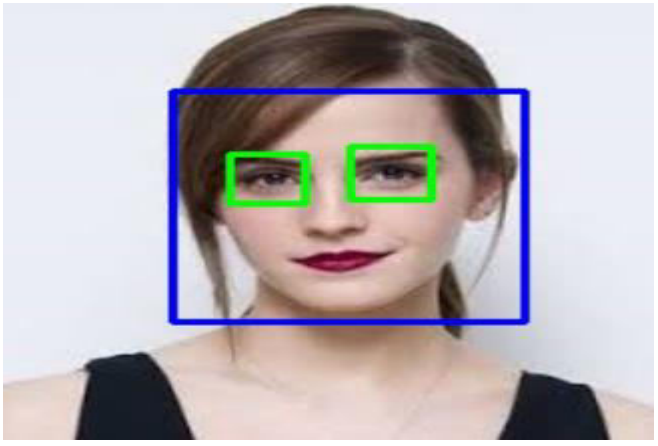

Fig 4: output of Face Detection.

VI. CONCLUSION AND FUTURE WORK

The simulation results shows thatDriver Drowsiness Detection was built to help a driver stay awake while driving in order to reduce car accidents caused by drowsiness. The system which can differentiate normal eye blink and drowsiness can prevent the driver from entering the state of sleepiness while driving. During the monitoring, the system is able to decide if the eyes are closed or opened. When the eyes have been closed for too long a warning signal is issued. The ultimate goal of the system is to check the drowsiness condition of the driver. Based on the eye movements

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of the driver, the drowsiness is detected and according o eye blink, the alarm will be generated to alert the driver and to reduce the speed of the vehicle. By doing this, many accidents will be reduced and provides safety to the driver and vehicle.The future works may focus on the utilization of outer factors such as vehicle states, sleeping hours, weather conditions, mechanical data, etc. for fatigue measurement. Driver drowsiness poses a major problem to highway safety. 24 hours operations, high annual mileage, exposure to the challenging environmental condition, and demanding work schedules all contribute to the serious safety issue.Monitoring the drivers state of drowsiness and vigilance and providing feedback on their condition so that they can take appropriate action is one crucial step in a series of preventive measure to necessary to address this problem. Currently there is no adjustment in zoom or direction of the camera during operation. Future work may be automatically zoom in on eyes once they are localized. This would avoid trade-off between having wide field of view in order to locate the eyes, and narrow view in order to detect fatigue

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