International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2371-2375 www.ijaem.net ISSN: 2395-5252

Driver Drowsiness Detection System Based On Eye Closure

Asst.Prof.Jain Stoble B, Asst.Prof.Rosemary Varghese, Asst.Prof.Remya Vinaya kumar

Dept.Computer Science and Engineering (of Aff.KTU) Adi Shankara Institute of Engg. and Technology Ernakulam, Kerala
Dept. Computer Science and Engineering (of Aff.KTU) Adi Shankara Institute of Engg. and Technology Ernakulam, Kerala
Dept. Computer Science and Engineering (of Aff.KTU) Adi Shankara Institute of Engg. and Technology Ernakulam, Kerala

Submitted: 01-07-2021 Revised: 13-07-2021 Accepted: 16-07-2021

ABSTRACT—The developments in technology over the years bring the support to drivers using smart vehicle systems. In the past few years, there has been a substantial increase in road accidents in India and worldwide as well. The most significant reasons for the same are drowsiness and fatigue. Therefore, driver drowsiness and fatigue detection is major possible area to prevent a large number of sleep induced road accidents.Considering this problem this paper proposes a drowsiness detection system based on eye closure.In this paper, the fatigue is detected based on the eye blinking which comes under the image processing.The proposed system is implemented in Raspberry pi and it is programmed in python programming language. It uses the Open CV library and dlib library. Using the facial landmarks the eye region is extracted. Real time tracking is done by a Raspberry camera module which is kept in front of the driver. Initially an alert is triggered and along with that the speed of the vehicle is being reduced in a way that it won't lead to an big accident. Index Terms—Image processing, Face detection, Eye detection, Alert System, Velocity reduction

Index Terms—Image processing, Face detection, Eye detection, Alert System, Velocity reduction

I. INTRODUCTION

Long distances and motorway driving can be tiring and monotonous. In recent years, drowsiness and fatigue have become the supreme reasons for causing severe road accidents in India and worldwide as well. The significant increment in the percentage of road accidents is due to the drowsiness of the driver.The advancement of technology for recognizing or forestalling drowsiness in the driver's seat is a noteworthy challenge in the field of accident evasion frameworks. It would in this manner be advantageous to figure out how to recognize drowsiness before it happens and to have the capacity to caution the driver in time. Enormous technologies are being implemented to reduce the road accident due to drowsiness of the driver. Various alerting systems have been enabled,still the probability of occurring in a road accident is extremely high.

II. LITERATURE REVIEW

Various techniques and technologies had been employed within the recent past to attain the objectives outlined in the above. These include drowsiness detection of a driver on android based application in which the eyelids are being monitored which has its own limitation[1].Face detection through MCT AdaBoost algorithm, the accuracy of the result depends on the size of the human eye, since the size will differ according to the person[2].An advanced Detection is through using circular hough transform and iris visibility ratio where it has its own limitations[3].IR illumination cameras are preferred than the normal ones.An Improved Real Time Eye State Identification System[4] has been implemented for the drowsiness detection. However, only an alert system is provided throughout the implementation.Even some drivers won't wake hearing the alert and hence it may lead to an accident.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2371-2375 www.ijaem.net ISSN: 2395-5252

III. PROPOSED METHOD

The proposed method is to detect the drowsiness of the driver and reduce the speed of the car along with providing an alert mechanism. The objective is to detect the closed eye and alert the driver along with reducing the velocity of the car.This is done by a Raspberry pi camera module which is mounted in the front of the driver for capturing the real time video. With the help of openCV and dlib the real time video of the driver is continuously captured. The entire process is categorized into two steps: (a) Face detection, (b) Eye closure detection, (c) Velocity Reduction.

A. Face Detection

In this step face is detected using the dlib library. Shape estimator that is implemented in the dlib library based on papers [5][6]is used to find facial landmarks. The estimator gives 68 landmark points that can be applied to localize regions of face such as eyes, eyebrows, nose, ears and mouth. Figure 1 gives the full set of facial landmarks that can be detected via dlib. Therefore by applying facial landmark detection eyes can be localized and detected.

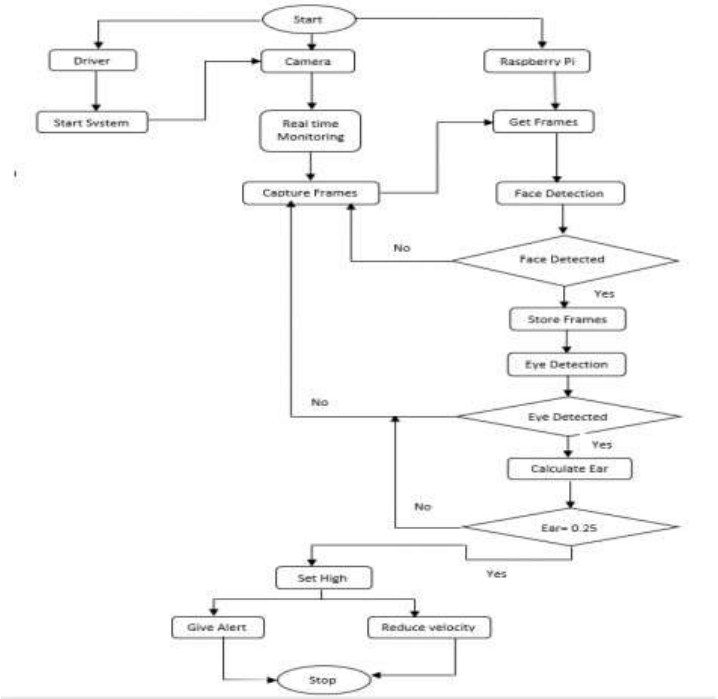

Fig. 1. Proposed Method.

B. Eye Closure Detection

Each eye is represented by 6 coordinates as in figure 3. An equation called Eye Aspect Ratio (EAR)[7]which reflects the relation between width and height of coordinators can be derived.

$$EAR = ||P2 - P6| + ||P3 - P5||/2||P1 - P4|| \quad (1)$$

The distance between vertical eye landmarks are computed in numerator and those of horizontal eye landmarks are computed in denominator.
This ratio of eye landmark distances can be used to determine whether a person is blinking.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2371-2375 www.ijaem.net ISSN: 2395-5252

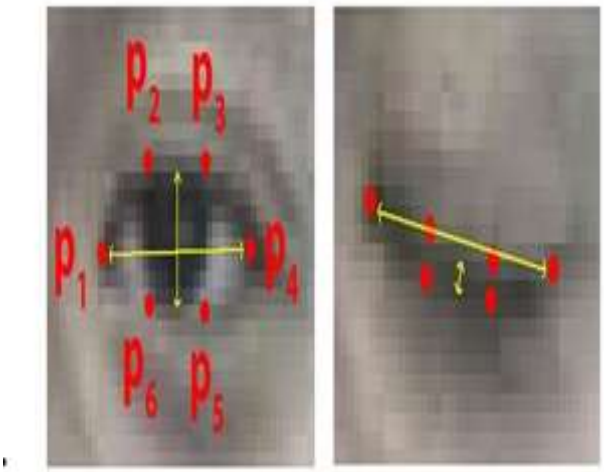

Fig. 3. The 6 facial landmarks associated with eye

Consider the figure 3. When the eye is fully open the eye aspect ratio would be large and relatively constant over the time and when the person closes the eye, the eye aspect ratio decreases approaching zero. The graph shows that eye aspect ratio is constant and then decreases to zero representing a blink. If the state of the eye remains closed for a certain period of time(2 seconds) an alert alarm will be given.

C. Velocity Reduction

On detecting the drowsiness the drowsiness level is set to high.This is so arrived in such a way that when the calculated drowsy value is high, the driver is being alerted and at the same time the speed of the vehicle is reduced.When the driver gets sleeps the chances of increasing the speed of the vehicle is extremely high, and thus it may cause the death of the driver.In such a situation, on reducing the speed of the vehicle, the chances of getting into big accidents is low.

The velocity reduction is done in such a way that a velocity sensor is used. The velocity sensor shows the speed of the vehicle. Velocity sensor contains a disc and on at both ends two tyres can be placed . Upon receiving the value as high, the sensor senses it and the motor that is giving velocity starts to reduce.

Fig. 2. Landmarks as depicted by dlib facial predictor

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2371-2375 www.ijaem.net ISSN: 2395-5252

IV. PREVIOUS WORKS

Previously, this system had an image recognition of the drowsiness state of the driver and an alert system to wake him up.This system was effective in identifying the state of the driver.And that system was proven effective and had Incorporated in high end premium models like Porsche, Volvo etc.

But the only drawback was that there was only a system to detect drowsiness and there was no system to reduce the Cruise speed to a non impact optimal speed.

As a result, even if the driver was woken up ,if the Cruise speed was very high it would be difficult for the diver to bring back the control of the vehicle. Also if he/she wakes up just before crashing somewhere , this system doesn't have any use in saving the life of the driver or reducing the impact of injury. So this system failed drastically and was later removed by the car and vehicle manufacturers.

So this system failed drastically and was later removed by the car and vehicle manufacturers.

A. Result

When this system is Incorporated using a camera(webcam) , raspberry pi , motor and a velocity sensor ,the result obtained was really effective.The camera detects the eyelid movements at different instances and these visual are processed by an image processing system.If this sensor finds the eyelids are sleepy, it sends signals to the velocity sensor the velocity sensor functions upon the motor to reduce the speed.Raspberry pi acts as the basic working environment.

B. Problems

The main problem in the project is that on detecting the drowsiness, the alert is triggered and along with it velocity of the vehicle is being reduced. On reducing the speed of the vehicle, the other drivers might not be aware of it and the chances of collision still will be possible.

C. Proposed Solutions

The proposed solution is that if the implementation of GPRS is enabled, when the drivers get drowsy the vehicle could be automatically parked near the road. Doing this reduces the cause of accidents.

V. FUTURE SCOPE

There are many possibilities of driver drowsiness detection system.In this system , it does not detect drowsiness if the driver has a cooling glass goggles on.so some other techniques should be incorporated to tackle this problem.Also the future system can integrate a feature that involves , sending an alert message to the known person about the state of the driver.By adding more features like finding the fatigue by the amount of thrust the driver applies on the steering will make this system more more effective.All these parameters should be added in a way that it does affect the speed and accuracy of the system.

VI. APPLICATIONS

The system generated can be used in any cars , jeeps and trucks and buses. As this system depends on image detection, its sensors and basic mechanics ,this system can be cooperated on almost all vehicles other than 2 Wheeler's.Even the cars are the base models , all these components in this system could be used.

CONCLUSION

This paper discusses a real time detection of drowsiness of the driver by considering the eye closure.The advantage of the system is detection of drowsiness in the early stage can reduce the impact of accident caused or could be completely avoided.there are several intrusive and non intrusive measures that could be adopted to build this system.The one using raspberry pi open CV will be the best one as it is optimal in size, cost power consumption.All the operations are performed with the help of a live camera.when the eyelid movement speed is much slower that the normal or if the eyelids are closed for too long then drowsiness is detected and the system starts functioning.

REFERENCES

[1] Marchel T. Tombeng, Argha Silitonga and Hence Kandow, "Android- Based Application To Detect Drowsiness When Driving Vehicle," 2019 1st International Conference on Cybernetics and Intelligent System (ICORIS) 22nd-23rd August 2019 at Institut Teknologi dan Bisnis (ITB) STIKOM Bali, Indonesia

[2] Jang Woon Baek, Byung-Gil Han, Kwang-Ju Kim, Yun-Su Chung, Soo- In Lee, "Real-time Drowsiness Detection Algorithm for Driver State Monitoring Systems " Electronics and Telecommunications Research Institute

[3] Sruthy. R, Dr. Smitha Dharan "Driver's Drowsiness Detection Using Cir- cular Hough Transform and Iris Visibility Ratio Analysis" International Journal of Engineering Research Technology (IJERT), Vol. 3 Issue 5,May - 2014

[4] Tianyi Hong, Huabiao Qin and Qianshu Sun, "An Improved Real Time Eye State Identification System in Driver Drowsiness Detection 2007 IEEE International Conference on Control and Automation ThBP-19 Guangzhou, CHINA - May 30 to June 1, 2007

[5] Bappaditya Mandal, Liyuan Li, Gang Sam Wang and JIe Lin, "Towards Detection of Bus Driver Fatigue Base on Robust Visual Analysis of Eye State", IEEE Transactions on Intelligent Transportation Systems, vol 18,No. 3, March 2017

[6] Vahid Kazemi and Sullivan Josephine, "One Millisecond Face Align- ment with an Ensemble of Regression Trees", 27th IEEE Conference on Computer Vision and Pattern Recognition, CVPR 2014, Columbus,United States, 23 June 2014 through 28 June 2014

[7] Tereza Soukupova and Jan Cech , "Real-Time Eye Blink Detection using Facial Landmarks", 21st Computer Vision Winter Workshop, Luke Cehovin, Rok Mandeljic, Vitomir Struc (eds.) Rimskke Toplice, Slovenia, February 3-5 2016.