Driver Fatigue Recognition System Using ImageProcessing

Rohan Agrawal[1], Soumyajit Samanta[2], Bimlesh Mishra[3], Pooja Raghav[4], Kiran Somase[5]
Department Of Computer Engineering,Savitribai Phule Pune University
Email: rohanagr8@gmail.com[1],sama.ntasoumyajit@gmail.com[2],bimlesh.mishra11@gmail.com[3],
pujaraghav93@gmail.com[4], kiran_somase@yahoo.co.in[5]

Abstract- Now a days, driver fatigue is the main cause which is responsible for the most of the road accidents. Around 20-25% of road accidents are due to driver fatigue. Driver drowsiness effects on driving performance and safety of the driver and passengers. This system is to detect driver drowsiness which includes the symptoms like eye closure and yawning. This system aims to integrate a camera in automotive vehicles to increase security and prevent accidents. Driver fatigue system helps to detect driver under drowsiness and the system alarms the driver for the drowsiness condition. Warning system uses alarm to alert the driver. The system reviews the facial expressions of the driver which reduces the driving performance and causes the fatal road accidents. It improves the driving which insures a safe road journey. The proposed system detects facial expression of the driver.The proposed system focuses on real time drowsiness detection technology instead long term sleepiness prediction technology. The system optimize driver through robust indicators. This indicators are principally based on driver's facial expression. The system shows a fairly good accuracy and reliable performance to avoid fatal road accidents. The proposed system avoids any complexity and is simple.

Index Terms- Driver Fatigue**,** Driver drowsiness,Human safety, Image Processing, Non-Intrusive

1. INTRODUCTION

Driver fatigue is the main cause of road accidents around the world. It represents lack of alertness in driver which is necessary for safe driving. Driver fatigue decreases the alertness and reduces the response time of the driver which in turn increases the chances of a road accidents. The high accidents rates are due the sleeplessness of the driver which causes low response time. Therefore the use of alert system that monitors the drivers alertness is important to prevent road accidents. These systems should then alarm the driver in case in attention. The report of The National Highway Traffic Safety Administration points to the facts that around 20-25% road accidents occurred due to the driver drowsiness.

The report of The National Sleep Foundation points to the facts that 40% of the driver have fallen asleep who were fatigue. The study of The Sleep Research Centre of UK has shown that 25% of road accidents due to driver fatigue. Passenger safety is the most crucial necessity for the road journey because almost all the accidents occur due to the human behavior and mistakes and only about 5-10% because of defective vehicles. Around 80% of the accidents due to high speed and lack of driving skills. The problem of driver drowsiness can be solved in a different ways. One of them is the driver facial expression. It includes non intrusive techniques which are used to measure visual behavior such as yawning and eye closure. Non intrusive methods are easy to detect facial expression for drowsiness recognition. Mouth gaping and eye closure are popular symptoms in the driver fatigue recognition. These symptoms are mandatory for any research. The approach in this system is robust and will consider all the drowsiness symptoms such as yawning and eye closure. The camera is used to visualize the face of the driver and is fixed on the dashboard. Then face, mouth and eye detection of the driver are performed. The detection process of the desired part of the face can be performed even in low lights using night vision camera.

The advancement in computing technology has led to building of intelligent system in vehicles. Fatigue driver system is the most important application of intelligent system. Excessive drowsiness results in the risk of vehicle crashes because the driver's reduce attention to the road or the driver falls sleep. It is often seen that sleepy drivers are unable to take correct action prior to a collision. This is a reason, developing system for monitoring driver's level of alertness and alarming the driver when he is fatigue and not paying adequate attention to the road, is necessary to prevent accident. The prevention of car crashes is the major focus in the field safety research. People in drowsiness show visual behavior which are observable from their facial features

like mouth and ice. Computer system can be a non-intrusive method to monitor driver's vigilance. Face is the most important part which is considered while giving the result regarding drowsiness which is the research target in computer vision.

2. RELATED WORK

2.1. *Robust Driver Fatigue Recognition Using Image Processing*

In present time the scientist has done a lot to vast research in the field of fatigue recognition by using different type of technique. Fatigue is one of the measure issue for all the driver but it mostly happen with the truck driver around the world. On the basis of the research on fatigue the physiological problem of the driver can be know and the vehicle company around the world can take appropriate step to safe human life. The system has to detect the face, mouth and position of head. The system generate the warning or alarm that raise alertness of driver . W. Zengcai and L. Yufeng has proposed that the face region of driver can be detected by using the camera of the system. Yawn of the driver can be detected by the distance between chin and midpoint of nostrils. The driver state of alertness can be detected by using viola-jones face detector and motion analysis. It suggested that by using the facial pose of driver we can detect the fatigue of driver. [1]

2.2. *DRIVER FATIGUE AND ROAD ACCIDENTS*

Driver fatigue is one of the important issue for the truck driver around the world. In an American study done in 1998 found that 20% of all the fatal crashes and fatalities happen between midnight and 6 a.m. this is the peak period for the driver fatigue. In this time the crash happen more than the other parts of day. Later many truck driver were interviewed related to fatigue, drowsiness condition. Around two-third of driver reported that of drowsy driving within previous month, 5% of the driver accepted of driving when drowsy on most. Half of driver reported of fallen asleep during driving at some point of time in their driving career. [6]

2.3. *Driver distraction: Theory, Effects And Mitigation*

In a report it found that around 23% of the vehicle accident and crashes occur due to distraction of the driver. These figure are increasing very rapidly day by day as more distraction both inside and outside of vehicle, which draw driver attention. Driver distraction mitigation, effects, and theory provide a overview of this issue, these effect the driving performance and

strategies. The road safety authorities play an important role to minimize the road accident happen due to driver distraction. The authorities are providing guidelines for the safety of the driver. [3]

3. PROPOSED SYSTEM

Driver fatigue recognition includes two procedures that are performance and driver behavioral state. Generally, driver fatigue symptoms are of various types such as yawning and eye open or close. The proposed system uses a camera which is fixed on the dashboard of the car in front of the driver. The camera is used to capture driver's fatigue behavioral symptoms. The system is used to detect eye closure mouth detection, yawning detection. The alarm system is designed from the decision made by the detection system. The proposed system alarms the driver's is any of the fatigue is found, which is easy to implement.
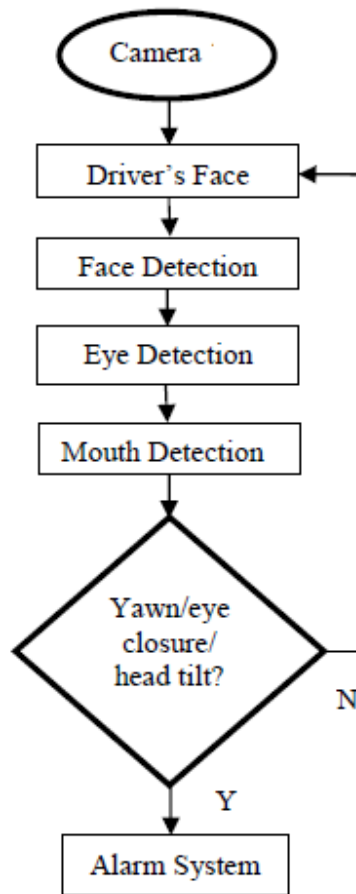
4. SYSTEM OVERVIEW

Fig.1 System Architecture

4.1. *Face Detection*

There are various kind of challenges in face detection such as orientation, position, lighting condition, shape, texture, color and variability of size. These challenges are taken into consideration in the face detection process. A camera is fixed and focused at the face of the driver. A skin color segmentation is used in the face detection process which helps to prevent challenges due to color, size and orientation of face. The brightness problem is solved by the conversion of RGB to YCbCr. Processing of skin color is faster than the processing of other facial features for detection of the face.

4.2. *Eye Detection*

Eye closure for more than a certain amount of time indicates the fatigue condition. The face image which was detected from the previous or last section is used for the input image for eye detection. Reason of concern for eye is extracted from face information. Computational complexity is reduced and system performance is improved from this extraction. Luminance components and chrominance are calculated to build eye map which points to eye region. White region of eye is indicated by the construction of binary image.

4.3. *Mouth Detection*

Mouth detection is used to detect yawning. Yawning is detected to find the difference between features of yawning mouth and normal mouth. The basic difference is the area of the mouth during yawning condition and normal condition. Red component is more than blue color in mouth area. So that Cb components give less value than Cr components in comparison other face region. The mouth map will undergo threshold check which converts it into black and white image.

4.4. *Yawn Detection*

Mouth has been detected and distinct noise has been eliminated, this has provided the location of mouth. This location is used to detect yawning mouth which is the biggest hole in face relative to eyes. Through non skin color segmentation the yawning mouth is found. The location of the detected mouth will come in the area of yawning mouth region during the yawning state. Generally at the time of yawning, the area of eye becomes narrow. This concludes that the other holes of face gets smaller except the mouth. [5]

5. CONCLUSIONS

The proposed system has all the features such as eye detection and mouth detection. The eye detection detects the eye closure and the mouth detection detects the opening of mouth. The proposed system will help to avoid the car crashes and other road accidents. This system is easy to access and implement. This proposed system is a low budget system. This system is practical to implement in vehicles because it can detect fatigue in unusual condition. Less complex algorithm for mouth, yawning and eye are used.

REFERENCES

[1] Rafi Ahmed, KaziEmrulKayesEmon, Md. Foisal Hossain, Robust Driver Fatigue Recognition Using Image Processing, 3rd Int. Conf. On Informatics, Electronics & Vision 2014

[2] J.D.Lee, K. L. Young, and M. A. Regon, "Defining driver distraction,"in Driver Distraction: Theory, Effects and Mitigation. Boca Raton,FL:CRC,2009.

[3] T. A. Ranney, E. Mazzae, R. Garrott, and M. J. Goodman, "NHTSAdriver distraction research: Past, present, and future," Transp. Res.Center Inc. East Liberty, OH, Tech. Rep., Jul. 2000.

[4] M. R. Rosekind, "Underestimating the societal costs of impairedalertness: safety, health and productivity risks", Sleep Medicine, vol.6, pp. S21-S25,2005.

[5] Jim Horne and Louise Reyner, Sleep Related Vehicle Accidents, SleepResearch Laboratory, Loughborough University, 2000.

[6] The Royal Society For The Prevention Of Accidents, Driver Fatigue And Road Accidents, A Lit. Review And Position Paper February 2001

[7] Final Report of the European eSafety Working Group on Road Safety,http://www.eu.int/information_society/programmes/esafety/index_en.htm, 2002.

[8] AnsgarMaisch,Powertrain Equipped with Intelligent Technologies, anEuropean Funded Project :PEIT,http://www.eu-peit.net/, 2004.

[9] S. Ribaric, J. Lovrenc_ić and N.Paves_ić, "A neural-network-basedsystem for monitoring driver fatigue", In: Proc. 15th IEEEMediterranean ElectrotechnicalConference,pp. 1356 – 1361, April2010.

[10] Qiong Wang, Jingyu Yang, MingwuRen, YujieZheng, "Driver FatigueDetection: A Survey", in The Sixth World Congress on IntelligentControl and Automation, vol. 2 ,pp. 8587 – 8591,2006.

[11] M. Omidyeganeh, A. Javadtalab, S. Shirmohammadi,"Intelligent driverdrowsiness detection through fusion of yawning and eye closure",IEEE International Conference on Virtual Environments Human-Computer Interfaces and Measurement Systems (VECIMS), pp. 1 – 6,2011