OPERATOR FATIGUE DETECTING AND ANALYSING SYSYEM

Shivansh Tiwari, Shiv Shankar Jaiswal

Abstract—Operator fatigue is defined as the mental triedness occured due to late night work. This system proposed to detect the mental tiredness of operator. There are several causes of road accidents: driver negligence, weather conditions, road invisibility, drowsiness, alcohol consumption, etc. Alcohol consumption is the main reason for the majority of road accidents. In recent years, an increase in the demand for modern transportation necessitates a faster car-parc growth. At present, the automobile is an essential mode of transportation for people. In 2017, a total of 97 million vehicles were sold globally, which was 0:3% more than that in 2016.

1 Introduction

A. What is Operator Fatigue ?

Operator fatigue is defined as the mental tiredness occurred due to late night work. This system proposed to detect the mental tiredness of operator. As the eyes closure occurrences dramatically increase during the ten second period preceding an accident, monitoring such closures is a good way to determine drowsiness and prevent the accident. This ten second range means that the system has to determine whether the driver is drowsy in only a few second. The algorithm that will be used should not only be fast but effective with as less false alarms (alerting when the driver is awake) and false findings (mistaking other features in the image as eyes) as possible. The tried approaches of Operator fatigue detecting system[1].

Driver fatigue and lack of sleep of drivers especially those who driver heavy vehicles such as trucks, buses etc., have been growing problems in recent years. Vehicle driving has been playing a very important role in avoiding the accidents over millions of people in the country, whose livelihood is more important to their children. The life and vehicle value in the months of October 2008. In this accident 9 died including two children because of lorry driver had fallen asleep. Nowadays, more than one-thousandth of high ways accidents were affected by massive

accidents that destroyed large parts of vehicles and human lives.

Drowsy, inattentive and enraged drivers are major causes of accidents. It is estimated that drowsiness contributes to more than 1,00,000 collisions each year resulting over 1,500 deaths and 40,000 injuries costing the government and businesses unbearable loss every year. Automatically detecting alertness of drivers early enough to warn them about their lack of alertness due to fatigue can save many lives, personal sufferings and businesses. Currently, transport systems are an essential part of human activities. We all can be victim of drowsiness while driving, simply after too short night sleep, altered physical condition or during long journeys. The sensation of sleep reduces the driver's level of vigilance producing dangerous situations and increases the probability of an occurrence of accidents. Driver drowsiness and fatigue are among the important causes of road accidents. Every year, they increase the number of deaths and fatalities injuries globally[2].

The causal reasons for accidents are classifed into three categories: Bad weather or bad infrastructure (rain, potholes on the road), vehicle malfunctioning (manufacturing defects or wear and tear) or human factors (physiological or behavioral). While the physiological mistakes are happening due to driver fatigue, drowsiness, behavioral mistakes could take many forms such as distracted driving, drunk driving, aggressive driving, road rage, hard acceleration, hard braking and cornering and speeding. Aggressive driving and road rage are a priori behaviors that are potentially leading to fatal or non-fatal road accidents, incidents of physical violence and even murders. Aggressive driving involves driving the motor vehicle in an unsafe and hostile manner without regards for others which includes unsafe behavior in road such as making frequent or unsafe lane changes, running red lights and stop signs, wrong-way driving, improper turns, tailgating, disrespecting traffic controls. Road rage is an angry driving behavior exhibited by the driver, which includes making rude gestures, making physical and verbal threats, and exhibiting dangerous driving methods targeted towards another driver in an effort to intimidate or release frustration. The increase in road accidents proportionately with increases with the frequency of insurance claims made by policyholders. The primary reason for insurers to introduce UBI is to bring in some realistic and correct measurability to ascertain the risk where the customers are exposed to and charge a risk-based premium suggested by an actuary. The premium charging method implies that policyholders who exhibited higher risk during driving need to pay a higher premium.

2. EXISTING SYSTEM

Some facial recognition algorithms identify faces by extracting landmarks or features from an image. For example, an algorithm may analyze the relative position, size, and/or shape of the eyes, nose, cheekbones and jaw. These features are then used to search for other images with matching features. Other algorithms normalize a gallery of face images and then compress the face data, only saving the data in the image that is useful for face detection. A probe image is then compared

with the face data. One of the earliest successful systems is based on template matching techniques applied to a set of salient facial features, providing a sort of compressed face representation.

(A) FACIAL RECOGNIZATION

One of the examples of a system detecting a driver's fatigue is the system implemented into the Driver Assistant in Ford cars. It analyzes rapid steering movements, driving onto lines separating lanes, irregular and rapid braking or acceleration. The system collects and processes these data, assigns the driver using one of the 5-degree concentration levels (5 – the driver is concentrated, drives properly, 1 – the driver is very tired, should immediately stop driving and rest) [3]. When the rating falls to level 1, the driver is notified by beeps and warnings on the instrument panel's middle screen. The system can be reset and the warnings will disappear, only when the driver stops and opens the door. Skoda cars uses a similar system. It analyzes the steering movements and compares them to the movements in normal driving. The system begins to analyze how the vehicle performs 15 minutes after starting the engine and at the speeds of more than 65 km/h . When the system detects that driving is abnormal, the driver's fatigue status is displayed on the screen, followed by a beep, informing the driver to take a break . Volkswagen uses the Bosch Driver Drowsiness Detection system (Fig. 1). It also analyses how a car behaves on the road. Based on the information from the power assisted steering sensor and the steering angle sensor, the system detects sudden changes in the trajectory of the vehicle, which translates into driver's fatigue .

Some driver fatigue detection methods use the heart rate analysis . The psychophysical state is determined by the HRV (heart rate variability). DENSO (manufacturer of car parts and systems) at the Detroit Auto Show presented a system that relies on a driver's heart rate analysis and the use of the cameras to observe a driver's eyes. Such a solution allows detecting a fatigue at the operator of the vehicle. There are also ideas for the use of electroencephalogram (EEG) to detect the driver's brain wave changes, which may indicate the first symptom of fatigue. The panel view implemented in Android is shown in Figure 1.

The PSA Group (formerly PSA Peugeot Citroën), in collaboration with the Lausanne University of Technology, are working on a camera-based system to analyze the facial expressions of a driver. It is interesting to note that the very early aim of this system was a detection of emotions of a driver, but they decided to develop it into the fatigue detection system) It is based on the analysis of eye movement, the closing and opening of the

eyelids as well as the movement of the mouth. It allows detecting the first symptoms of a fatigue. Information provided by this system will inform a driver on the state of her/his psychophysical state.

2. RELATED WORK

In this section, we categorize the related work into three parts, prototype algorithm design version, the facial landmarks recognition algorithm and analysis of person present on camera.

A. Prototype algorithm design version

This part aims to present the design of the Driver Drowsy Detection System. The original aim of this project was to use the retinal reflection (only) as a means to find the eyes on the face, and then using the absence of this reflection as a way of detecting when the eyes are closed. It was then found that this method might not be the best method of monitoring the eyes for two reasons. First, in lower lighting conditions, the amount of retinal reflection decreases; and second, if the person has small eyes the reflection may not show.

As the project progressed, the basis of the horizontal intensity changes was used. One similarity among all faces is that eyebrows are significantly different from the skin in intensity, and that the next significant change in intensity, in the y-direction, is the eyes. This facial characteristic is the center of finding the eyes on the face, which will allow the system to monitor the eyes and detect long periods of eyes closure. Each of the following sections describes the design of the driver drowsiness detection system.

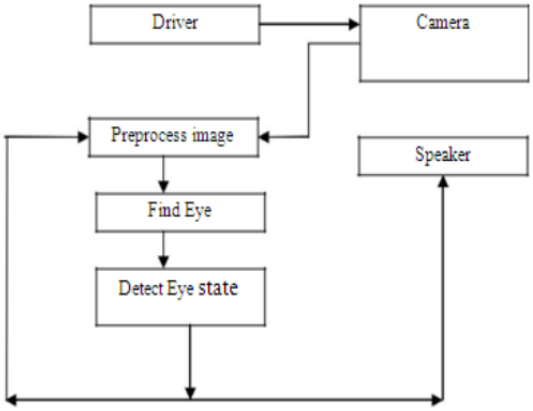


Fig. 1 Block Diagram of OFDS

3. KEY TEMINOLOGY

A) OPERATOR FATIGUE DETECTING

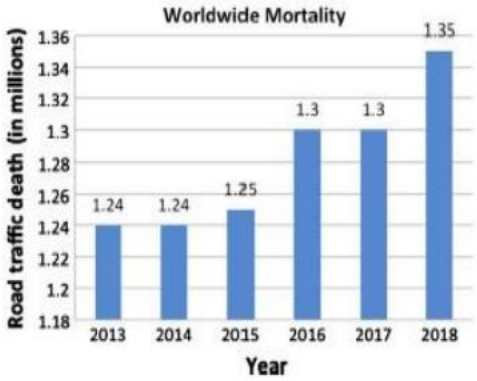
Operator Fatigue detection can be divided into two types: contact approaches and non-contact approaches. In contact approaches, drivers wear or touch some devices to get physiological parameters form detecting the level of their fatigue. Warwick et al. implemented the Bio Harness on the driver's body to collect the data and measure the drowsiness. Li et al. used a smartwatch to detect driver drowsiness based on electroencephalographic (EEG) signal. Jung et al. [reformed the steering wheel and set an embedded sensor to monitor the electrocardiogram (ECG) signal of the driver. However, due to the price of contact approaches and installation, there are some limitations which cannot be implemented ubiquitously. The other method employs a tag-free approaches to detect the driver drowsiness, where the measured object does not need to contact the driver. For example, Omidyeganeh et al. used the driver's facial appearance captured by the camera to detect the driver drowsiness, but this method is not real time. Zhang and Hua used fatigue facial expression reorganization based on Local Binary Pattern (LBP) features and Support Vector Machines (SVM) to estimate the driver fatigue, but the complexity of this algorithm is bigger than our algorithm. Moreover, Picot et al. proposed a method that uses electro oculogram (EOG) signal and blinking feature for drowsiness detection. Akrout and Mahdi and used a fusion system for drowsiness detection based on eye state and head position. Different from these methods, we employ simple formulae and evaluations, which make the results easier to measure and it is very useful to detect the mental tiredness of operator in every and total aspect.

B) IMAGE RECOGNIGATION

Image recognition is a basic human intelligence, widely used in people's daily life. With the rapid development of computer technology and electronic technology, computer can process image in real time, and the efficient image processing algorithm and image recognition technology occupy an important position. In the intelligent transportation system. Image recognition technology is a research direction of artificial intelligence. Image recognition technology is based on the main characteristics of the image. In the process of image recognition, the image must be preprocessed, the redundant information of the image should be removed, and the key information (i.e., features) should be extracted. Then the classifier can be obtained by classifying the training samples. Image recognition is a basic human intelligence, widely used in people's daily life. With the rapid development of computer technology and electronic technology, computer can process image in real time, and the efficient image processing algorithm and image recognition technology occupy an important position in the intelligent transportation system. Image recognition technology is a research direction of artificial intelligence. Image recognition technology is based on the main characteristics of the image In the process of image recognition, the image must be preprocessed, the redundant information of the image should be removed, and the key information (i.e., features) should be extracted. Then the classifier can be obtained by classifying the training samples.

C). Reveling Stats about death due to road accident

Worldwide mortality as a result of road accidents from 2013 to 2018 is shown in Fig. 2[5].



does not reflect the real picture of all the accidents as the deaths of pedestrians and cyclists due to the accidents are not included in the statistics. If those numbers are also included, then the overall 2018 statistics of World Health Organization points out that

• More than half of all road traffic deaths occurred among young adults aged 15–44.

• Road traffic crashes were ranked as the 9th leading cause of death and accounts for 2.2% of all deaths globally.

• Unless some remedial action is initiated, road traffic injuries would likely to become the fifth leading cause of death by 2030.

The causal reasons for accidents are classified into three categories: Bad weather or bad infrastructure (rain, potholes on the road),vehicle malfunctioning (manufacturing defects or wear and tear) or human factors (physiological or behavioral). While the physiological mistakes are happening due to driver fatigue, drowsiness, behavioral mistakes could take many forms such as distracted driving, drunk driving, aggressive driving, road rage, hard acceleration, hard braking and cornering and speeding. Aggressive driving and road rage are a priori behaviors that are potentially leading to fatal or non-fatal road accidents, incidents of physical violence and even murders.

D). UNIQUE FEATURES OF THE PROJECT

As the eyes closure occurrences dramatically increase during the ten second period preceding an accident, monitoring such closures is a good way to determine drowsiness and prevent the accident. This ten second range means that the system has to determine whether the driver is drowsy in only a few seconds. The algorithm that will be used should not only be fast but effective with as less false alarms (alerting when the driver is awake) and false findings (mistaking other features in the image as eyes) as possible.

Author	Publisher	Tittle	Work
(1) Vishnu Yarlagadda, Shashidhar G. Koolagudi, Manoj Kumar M V, Swapna Donepudi	IEEE (December 2020)	Driver Drowsiness Detection Using Facial Parameters and RNNs with LSTM	In this project we detect the state of drowsiness using facial parameters obtained using facial points with the help of RNNS and LSTM with accuracy of 90.25%.
(2) WANGHUA DENG AND RUOXUE WU	IEEE (21st August 2019)	Real-Time Driver Drowsiness Detection System Using Facial Features	In this paper, we propose a system called "DriCare", which detects the drivers' fatigue status, such as yawning, blinking, and duration of eye closure, with accuracy of 90%.
[3] Subramanian Arumugam* and R. Bhargavi	Springer (2019)	A survey on driving behavior analysis in usage based insurance using big data.	In this research paper, PayHow-You-Drive (PHYD) model is developed in which the premium is charged for the personal auto insurance depending on the post-trip analysis.
[4] Jun Wang, Xiaoping Yu*, Qiang Liu,and Zhou Yang	Springer (2019)	Research on key technologies of intelligent transpotation based on image recoznigation and anti fatigue.	This paper focuses on the traffic safety caused by fatigue driving based on image recognition of key technologies for research and analysis. It uses KNN algorithm with accuracy of 87.82%.
[5]Felipe Jiménez José Eugenio Naranjo , José Javier Anaya , Fernando García b	ScienceDirect (18 April 2016)	Advanced Driver Assistance System for road environments to improve safety and efficiency	In this project, advanced driver assistance system (ADAS) for rural and intercity environments is proposed. The system focuses mainly on compared to motorways and the high number of severe and fatal accidents on them.

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