

**TOWARDS DETECTION OF BUS DRIVER FATIGUE**¹TUSHAR RAJPOOT, ²PRASHANT RAJPOOT, ³SUPRIYA PANDITA

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Abstract — In this system, we proposed to reduce the number of accidents caused by driver fatigue and thus improve road safety. This system treats an automatic detection of driver drowsiness based on visual information and artificial intelligence. We locate, track and analyze both the driver face and eyes to measure PERCLOS (percentage of eye closure) with Softmax for neural transfer function. Driver's fatigue is one of the major causes of the traffic accidents, particularly for drivers of large vehicles (such as buses and heavy trucks) due to prolonged driving periods and boredom in occupied conditions.

Keyword: Bus drivers, fatigue, stress, visual information, PERCLOS, softmax.

I. INTRODUCTION

Driver fatigue is when the driver's ability to drive safely is reduced as a result of being physically or mentally tired or sleepy. Driver fatigue or is a significant safety hazard for a road transport industry. The main causes of the 'drowsy driving' are too little sleep, driving at times when you would normally be asleep and working or being awake for very long hours. To detect driver drowsiness can be classified into the three categories:

- 1) vehicle-based approaches,
- 2) behavior-based approaches, and
- 3) physiological-signal based approaches.

In physiological approaches, the physiological signals from a body, such as electroencephalogram (EEG) for brain activity, electrooculogram (EOG) for eye movement, and electrocardiogram (ECG) for heart rate, are evaluated to detect driver drowsiness. Recent studies show that the methods using physiological signals (specially the EEG signal) can achieve better reliability and accuracy of driver drowsiness detection compared to other methods.

FATIGUE, drowsiness and sleepiness are often used synonymously in driving state description. Involving multiple human factors, it is multidimensional in nature that researchers have found difficult to define over past decades. Despite the ambiguity surrounding fatigue, it is a critical factor for driving safety. Studies have shown that fatigue is one of the leading contributing factors in traffic accidents worldwide. It is particularly critical for occupational drivers, such as drivers of buses and heavy trucks, due to the fact that they may have to work over a prolonged duration of the driving task, during the peak drowsiness periods.

II. LITERATURE REVIEW

Project Name: Towards Detection of Bus Driver Fatigue Based on Robust Visual Analysis of Eye State

Abstract : Driver's fatigue is one of a major causes of traffic accidents, particularly for a drivers of large vehicles (such as buses and heavy trucks) due to prolonged driving periods and boredom in working conditions. In this paper, they propose a vision-based fatigue detection system for bus driver monitoring, which is easy and flexible for the deployment in buses and a large vehicles. The system consists of modules of head-shoulder detection, face detection, eye detection, eye openness estimation, fusion, drowsiness measure percentage of eyelid closure (PERCLOS) estimation, and a fatigue level classification. The core innovative techniques are as follows: 1) an approach to estimate the continuous level of eye openness based on the spectral regression; and 2) a fusion algorithm to estimate the eye state based on adaptive integration on the multimodal detections of both the eyes. A robust measure of a PERCLOS on the continuous level of eye openness is defined, and the driver states are classified on it. In experiments, systematic evaluations and analysis of proposed algorithms, as well as comparison with a ground truth on PERCLOS measurements, are performed. The experimental results shows the advantages of the system on accuracy and robustness for the challenging situations when a camera of an oblique viewing angle to the driver's face is used for a driving state monitoring.

Author: Bappaditya Mandal, Liyuan Li, Gang Sam Wang, and Jie Lin

Project Name: Automatic Detection of Driver Fatigue Using Driving Operation Information for Transportation Safety

Abstract: Fatigued driving is the major cause of road accidents. For this reason, the method in this paper is based on the steering wheel angles (SWA) and yaw angles (YA) information under real driving conditions to detect the drivers' fatigue levels. It analyzes the operation features of the SWA and YA under different fatigue statuses, then calculates the approximate entropy (ApEn) features of a short sliding window on time series. Using the nonlinear feature construction theory of the dynamic time series, with the fatigue features as input, designs a "2-6-6-3" multi-level back propagation (BP) Neural Networks classifier to realize the fatigue detection. An approximately 15-h experiment is carried out on a real road, and the data retrieved are segmented and labeled with the three fatigue levels after expert evaluation, namely "awake", "drowsy" and "very drowsy". The average accuracy of 88.02% in a fatigue identification was achieved in the experiment, endorsing the value of a proposed method for engineering applications.

Author: Zuojin Li *, Liukui Chen, Jun Peng and Ying Wu *

Project Name: Bus Driver Fatigue and Stress Issues Study

Abstract: This study was conducted with an "regulation neutral" approach. While an information derived from the study may be useful for a decision making by the FHWA/OMC, the study does not provide the recommendations concerning changes to the existing regulations or the creation of new regulations for the motor coach industry. Human error is a causative factor in 85% or more of all the crashes. The National Transportation Safety Board (NTSB) has documented numerous motor coach accidents that have resulted in the fatalities where the driver fatigue has been determined to be a principal cause.

Author: Mr. Phil Hanley

Project Name: Potential causes of driver fatigue: a study on transit bus 2 operators in Florida

Abstract: This research study examines the safety impacts of the existing operator hours of a duty policies in 51 state of Florida. Thus, this study uses questionnaire surveys, the incident data archived by transit 52 agencies and bus driver schedules to determine the relationship between the crash involvement and the 53 operator schedules. Factors of interest in this study are the influence of the shift pattern (start and 54 end time), schedule pattern (split or non – split schedule) and the time spent on driving. The study 55 revealed that, operators working split schedules are more susceptible to fatigue than those 56 working straight schedules. The group of operators working split schedules indicated less time of 57 sleep, long driving hours and a early starting – late ending schedule patterns. These the 58 characteristics of fatiguing work schedule. There is also the strong statistical significance value

Author: Thobias Sando,

Project Name: Factors of Fatigue and Bus Accident

Abstract: The main purpose of this study is to identify a relationship between the factors of fatigue (working schedule, working condition) and the bus accident. 60 bus drivers from the bus agency in Kuching, Sarawak, Malaysia were selected as a sample. Survey questionnaire was used for an data collection. They were questioned individually because the most of them possessed a low level of education and facing the difficulties in understanding a questions in English. From a Pearson Correlation Analysis, the findings revealed that there was a significant relationship between the working schedule ($r=0.486$, $p=0.000$), working condition ($r=0.601$, $p=0.000$) and bus accident. The dominant factor that showed strongest unique contribution based on Multiple Regression Analysis was in working condition ($r^2=0.404$, $\beta=0.478$). Serious attention should be given to improve the buses and the working condition to reduce the accident rates in Malaysia. It is also recommended that the working schedule to be revised accordingly by taking into a consideration the bus driver's constraint.

Author: Dayang Nailul Munna Abang Abdullah 1 and Ho Li Von2

Project Name: BUS DRIVER : FACTORS THAT INFLUENCES BEHAVIOUR

Abstract: The behavior of drivers is influenced by a many factors, which include the personal characteristics, environmental and a vehicle characteristics. Professional drivers, such as bus drivers, generally have higher levels of training and the experience, and by the virtue of their profession have attitudes, which are more likely to promote a safe driving. However, a bus drivers experience the same environmental traffic condition as other drivers, as well as additional constraints imposed by a vehicle characteristics, concern for passengers' comfort/safety and the need to adhere the timetables. This paper reviewed these factors from the previous researches.

Author: M.M. Rohani1 , R. Buhari2

Project Name: Fatigue Factors Affecting Metropolitan Bus Drivers: A Qualitative Investigation.

Abstract: Metropolitan bus drivers daily face work in a stressful and the draining work environment, exposing them to the serious risk of driver fatigue. However, there has been the dearth of information exploring the unique antecedents and a effects of such fatigue. To date, much of the research into metropolitan bus drivers has been under the umbrella of large heavy vehicle driving studies, which include a disproportionally large population of a long-haul drivers, who are likely to face the significantly different set of fatigue factors . The present study aimed to investigate which work and an environmental factors may cause fatigue in metropolitan bus drivers by seeking a drivers' own perspectives on the issues. To this end, focus groups were held at five bus depots in the Sydney and Newcastle, with an effort made to include a

stratified sample of drivers at each. Each of the groups were invited to nominate what factors they felt were most salient, with the number of common factors emerging across the depots. Key themes identified were: support from management; ticketing and related issues; interaction with passengers; cabin ergonomics; tight route schedules; turn-around and shift irregularity; extended shift cycles; interactions with the other road users; and a extended commute times.

Author: Herbert Biggsa* Donald Dingsdagb Nick Stenson

Project Name: Occupational Health Hazards: A Study of Bus Drivers

Abstract: Health has always been closely linked with the occupation. Sound health in the relation to vocation and employment is the most important aspect of the very life of an individual who works and to the society as a whole. Occupational hazards natural in the work environment have become an more prominent in the post-industrial societies. These include the wide range of health problems ranging from the asthma, heart attack, high blood pressure, stress and other psychological disorders, with many more to list. Occupational health is therefore, an aspect seeking attention at individual, group and a community levels. The related study deals with the ergonomics—the link between the worker and his working environment. This would have impact on the body and discomfort reflected in the various parts of the body bringing about the certain health problems. The present article is an attempt to explore an health hazards among the bus drivers and conductors employed in the State Road Transport Corporations. The attempt is directed at investigating risk factors at the micro-level in a community of drivers and the conductors. It not only establishes an link between the health and work environment but also facilitates in assessing the adverse impacts that may be expected.

Author: Bindu Bhatt Seema M.S.

I. EXISTING SYSTEM

A driver falls asleep, then the driver loses control over the vehicle, an action which often results in a crash with either another vehicle or any object. In order to prevent these devastating accidents, there was the previous approach developed, in this system the state of drowsiness of the driver was monitored. The following measures were used widely for monitoring drowsiness:

- (1) Vehicle-based detection: A number of actions/metrics, including deviations from lane position, movement of the steering wheel, pressure on the acceleration pedal, etc., are constantly monitored and any change in these that crosses the specified threshold indicates a significantly increased probability that the driver is drowsy .
- (2) Behavioral measures: The behavior of the driver, including yawning, eye closure, eye blinking, head pose, etc., was monitored through a camera and the driver was alerted if any of these drowsiness symptoms are detected.
- (3)Physiological measures: The correlation between physiological signals (electrocardiogram (ECG), electromyogram (EMG), electrooculogram (EOG) and electroencephalogram (EEG)) and driver drowsiness was studied.

II. PROPOSED SYSTEM

In recent days, driver drowsiness has been one of the major causes of road accidents and can lead to severe physical injuries, deaths. Statistics indicate the need of a reliable driver drowsiness detection system which could alert the driver before a incidents takes place. The proposed system is a driver eyes monitoring system that can specially works on drivers eyes and face region. Firstly the eyes and face regions are monitored by camera. Secondly, Iris structuring, jaw angle finding and calculation is done using regression analysis, Haar (cascade classifier algorithms) which will examine the eyes are open or closed, then system will detect whether driver is sleeping or not sleeping. If driver is sleeping the alarm rings.

Advantages of Proposed System

1. System is able to distinguish the simulated drowsy and sleepy states from the normal state of driving on the low resolution images of faces and eyes observed from an oblique viewing angle.
2. Effectively monitors the bus driver's attention level without extra requirement for cameras.
3. The System approach could extend the capability and applicability of existing vision-based techniques for driver fatigue detection.

V. SYSTEM ARCHITECTURE

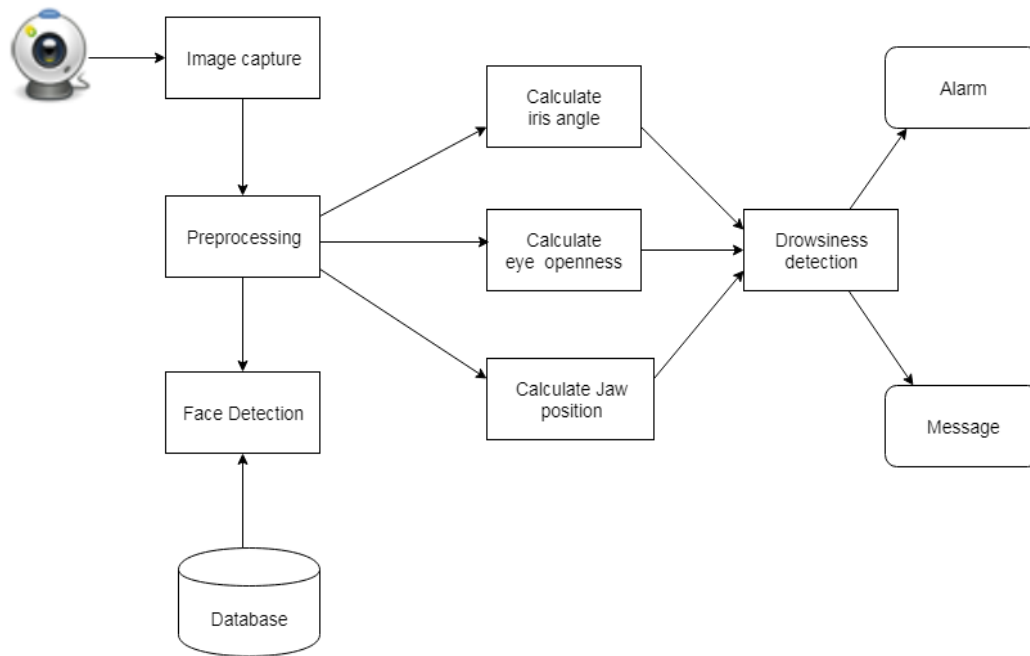


Figure 6.1: Proposed system architecture .

VI. CONCLUSION AND FUTURE WORK

A vision-based method and system towards bus driver fatigue detection using existing dome cameras in buses.

Approach starts with the detection of head-shoulders of the figure in the image, followed by face and eye detections and eye openness estimation. Hence, system might be able to effectively monitor bus driver's attention level without extra requirement other than cameras.

VII. REFERENCES

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