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Visual Analysis of Driver's Behaviour Detection System: a Survey

Engineering

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ABSTRACT

In recent days, every human is in hurry to reach their destination like home, college, office, shopping mall, etc as soon as possible. To reach their destination quickly, so they use vehicles on road and drive themselves in faster mode which results in road accidents. The driver behaviour is a major cause for the road accidents. To address this problem, Driver's behaviour analysis and prediction models need to be developed. In respect to measurement of methods of driver drowsiness, we discussed visual and non-visual features of driver behaviour, as well as driving performance behaviour related to vehicle-based features. Visual features measurements such as eye related measurements, yawning detection, facial expression are discussed in detail. As for non-visual features, we explore various physiological signals and possible drowsiness detection methods that use these signals. As for vehicle-based features, we describe steering wheel movement and the standard deviation of lateral position. In this paper we have discussed some of existing driver's behaviour models.

I .INTRODUCTION

Nowadays, in tune with economic growth in every country, the no of vehicles increases every year. At the same time, the number of non-expert drivers also increases rapidly. Most of the drivers are unskilled, unfamiliar with the vehicle conditions and not awareness of traffic rules and regulations. Driver's personal factors have become the main reasons of traffic accidents. Most of traffic accidents occur due to a driver's diminished vigilance level. Recent statistics show that 20% to 30% [1] of the traffic accidents are occurred due to Drivers with a diminished level. As per world health organization (WHO) reports, traffic accidents are one of the most important causes of mortality. More than 1.3 Million victims claim life annually. The injured victim are are around 50 million over the world. The distraction of driving has classified in to 3 categories.

Manual Distraction:
The driver takes his hands off the wheel. This includes for example text messaging, eating, using navigation system, or adjusting radio.

Visual Distraction:
The Driver takes his eyes off the Road, for example reading or watching a video.

Cognitive Distraction:
The drivers mind is not fully focused on driving. This can happen when the driver is talking to other passengers, Texting, or simply thinking.

Our approach aims at determing first if a driver is distracted or not, and in the case he is, the system should be able to recognize the type of distraction. Based on computer vision technique, we propose four different Modules, focusing on arm position, face orientation, facial expression and eye behaviour. We propose two strategies to combine e output information from each module: an adaboost classifier with temporal smoothing,and a hidden markov model-bassed classifier.

2. DRIVING BEHAVIOUR FEATURES:

Driving behaviour features or driving performance measures include steering wheel movement; lane keeping, acceleration pedal movement and braking etc.these features correlate to vehicle type and variability among drivers in their driving habits, skills and experience[7]. The two most commonly used driving behaviour measures for detecting method are

2.1. Steering wheel Movement (SWM):
The steering wheel movement is measured using steering angle sensor mounted on the steering column. When the driver is Drowsy, the number of micro-corrections to the steering wheel, which are necessary in normal driving is reduced [3][5]. SWM's are adapted by car companies such as Nissan and Renault.

2.2 Visual features:
usually, facial movements such as eye blinking, frequent yawning and nodding or swinging head are key elements among visual features used for detecting drowsiness [5].

2.3 Non-visual features :
non-visual features or physiological signals such as heart rate and brain activity are useful in predicting drowsiness, with fewer false positives compared to visual features because the determination of a drowsy state from visual features can be possible only after the driver is well on the way to sleep[5][9].

3. DRIVER'S BEHAVIOR ANALYSIS MODELS:

The categories of driving behaviour are as follows

3.1 Normal behaviour:
The driver behaviour is said to be normal when he concentrates on the driving task.This can be characterized by controlling the speed of the vehicle, avoding of sudden acceleration, driving without controlling the speed [2].

3.2 Fatigue behaviour:
Fatigue driving was defined as driving that exhibits the same characteristics as drunk driving, but there is no alcohol intoxication in the blood of the Driver [2][12].

3.3 Reckless Behaviour:
It is the behaviour of the driver who drives at high speed, with a high degree of acceleration and makes other traffic Participants at risk. There is no alcohol intoxication and driver's eye are open, behaviours such as driving with sudden acceleration, not maintain the proper lane position and not controlling the vehicle's speed are exhibited.[1]

3.4 Drowsy behaviour:
It is the behaviour of the driver's drowsiness is the major factor for most for the vehicle accidents. Some of the accidents related with the driver's mental condition but it also depends upon the drivers health conditions.[8]

4. LITERATURE SURVEY

4.1 Image processing Based Method

In image processing based Technique, driver's face images are used for processing, so that one can find its states. From the face image one can see that driver is awake or sleeping. using same images, they can define drowsiness of driver because in face image if driver is sleeping or dozing then his/her eyes are closed in image. And other symptoms of drowsiness can also detect from the face image [1].

4.2 Embedded system based Method

The embedded system design consisting of MEMS-Micro Electro Mechanical System's-global Subscriber module, GPS-Global Position System, alcohol detector.[3] Eye blinks detector, gas leak detector, fire detector. Most of the researchers tried to monitor the behaviour of the vehicle or the driver in isolation, while others have focused on monitoring a combination of the vehicle, the driver and the environment in order to detect the status of the driver so as to prevent road accidents.[17]

4.3 Based on vehicle OBD information and AdaBoost Algorithm Method

Shi-Hung chen,jeng-Shyang Pan, and Kailua Lu IN [12],Proposed a novel driving behaviour analysis method based on the vehicle on board diagnostic(OBD) information and AdaBoost algorithms which collects vehicle operation information, including vehicle speed, engine RPM and calculated engine load, via OBD interface.

4.4 Context Aware computing Method

Context aware computing refers to a general class of mobile systems that can sense their physical environment, and adapt their behaviour accordingly. Context-aware systems are a component of a ubiquitous computing or pervasive computing environment. Three important aspects of context are: where you are; who you are with; and what resources are nearby. Although location is a primary capability [4].

4.5 wireless communication Based Method

Wireless communication and mobile computing have led to the enhancement of an improvement in the Intelligent Transport System(ITS) that focus on road safety applications.vehicle ad-hoc network(VANET) have emerged as an application of mobile ad-hoc Network(MANET)[5].

4.6 Steering Wheel Movement (SWM) based Method

Steering wheel movement method is measured using steering angle sensor mounted on the steering column. when the driver is drowsy, the number of micro-corrections to the steering wheel, which are necessary in normal driving, is reduced[17]. The Driver's drowsiness state is determined from small SWM's of between 0.5^0 and 5^0[13].

5. CONCLUSION

A Survey has been conducted on visual analysis of driver behaviour and prediction models till date. Driver behaviour such as visual features, non-visual features and driving performance behaviour are explored to detect driver drowsiness. A more precise definition of driver behaviour analysis models would focus on various methods to understand the driver behaviour, and also give information regarding driver driving information. the driver behaviour prediction models give predictions of The driver's driving nature whether the driving is safe or not. This enlightens various behaviour models, which may help the researches to carry out similar research work in this field in future

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