Driver Drowsiness Detection and Monitoring System (DDDMS)

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***Abstract*—The purpose of this paper is to develop a driver drowsiness and monitoring system that could act as an assistant to the driver during the driving process. The system is aimed at reducing fatal crashes caused by driver's drowsiness and distraction. For drowsiness, the system operates by analysing eye blinks and yawn frequency of the driver while for distraction, the system works based on the head pose estimation and eye tracking. The alarm will be triggered if any of these conditions occur. Main part of the implementation of this system will be using python with computer vision, while Raspberry Pi, which is uniquely designed, for the hardware platform and the speaker for alarming. In short, this driver drowsiness monitoring system can always monitor drivers so as to avoid accidents in real time.**

***Keywords*—Distraction; drowsiness; eye blink; yawn; head pose estimation; eye tracking; computer vision; Raspberry Pi**

I. INTRODUCTION

Driver distraction and drowsiness are the major public health concerns and have led to road accident that have become one of the major causes of death and injuries in Malaysia. The Bukit Aman Investigation and Traffic Enforcement has reported that in the first six months of 2019, the country reported 281,527 road accidents, an increase of 2.5%, compared to 274,556 in the same period last year. These often stem from peoples' mistakes that occur in different activities related to vehicle driving. The term "drowsy" indicates "sleepy," as in prone to falling asleep. Drowsiness is commonly induced by a lack of sleep, certain medications, and boredom produced by driving a vehicle for extended periods of time. The driver will lose control of his vehicle when sleepy, resulting in an accident. Driver distraction is defined by the National Highway Traffic Safety Administration (NHTSA) as the process through which drivers redirect their attention away from driving duties. Drivers are often distracted by activities taking place around them, such as texting, talking on cell phones, or conversing with others. All these activities divert drivers' attention away from the road, which can lead to accidents that threaten drivers, pedestrians, and even other vehicles on the road.

Many efforts have been made to reduce all these numbers such as developments in computers that can be used to track drivers' conditions with the ability of alerting in dangerous situations [1]. Using physiological measures, ocular measures, and performance measures, a variety of methods have been investigated and applied to describe driver drowsiness and distraction. Despite the effort, since many studies are focused on referring to the non-direct function, driver drowsiness and monitoring systems have not become widespread. Thus, this paper describes the design and development of a Driver Drowsiness and Monitoring System using Raspberry Pi minicomputer with a webcam making the system cost-effective and portable. The objective of the work is to develop driving assistant system that can help driver to stay alert while driving so that numerous accidents can be reduced or prevented. This paper is organized as follows.

In Section II, this paper presents the previous works. Section III presents the proposed Driver Drowsiness and Monitoring System. In Section IV, the paper discusses the results of the experiments to show accuracy of the system. Finally, the conclusion and future work will be explained in Section V.

II. RELATED WORK

A. Driver Drowsiness and Monitoring System

Due to large number of accidents occurring over time, the ability to detect driver's distraction and drowsiness, then alarming them in real time becomes challenging. In order to improve the system development, a few existing systems in the market have been studied and discussed. Majority of the applications are integrated with the single functionalities only. Anti-Sleep Pilot is the dashboard device that will monitor both driver and their driving condition. It will let the driver know when it's time to take a ten-minute rest and pull over. The device continuously calculates the driver's fatigue level once driving started and status displayed. Driver alertness is also maintained and measured through occasional reactive tests in which the device must be touched as soon as indicated. If the combination of variables approaching the limit, the visual and audible signals from the Pilot will be activated to the fact that the driver need to take a break- the system is adaptive to light and sound, so that its monitor and warning automatically change for cabin conditions.

In industry, systems based on near-IR are the most common. The Saab Driver Attention Warning System detects visual inattention and drowsy driving. The system uses two

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