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Driver's Face Tracking Based on Improved CAMShift

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***Abstract*—** The statistic shows that the number of casualty increase in every year due to road accident related to driver drowsiness. After long journey or sleepless night, vehicle driver will perform some bio-features with regard to drowsiness on them face. It is self-evident that getting location information of head in continuous monitoring and surveillance system rapidly and accurately can help prevent many accidents, and consequently save money and reduce personal suffering. In this paper, according the real situation in vehicle, an improved CAMShift approach is proposed to tracking motion of driver's head. Results from experiment show the significant performance of proposed approach in driver's head tracking.

***Index Terms*—** Color space, Face tracking, CAMShift, Mean Shift, Probability Distribution Function

I. Introduction

With the increasing popularity of automobiles, the traffic accidents have become severe social problems. Recent statistic shows that the number of fatalities due to road accidents in Malaysia increased 1.9% to 6,872 deaths in 2010 from 6,745 deaths in 2009. In a separate online survey by the community project Malaysians Unite for Road Safety (MUFORS), 61.6% of the respondents believed that human error is the biggest cause for road carnages, while 15.6% of the respondents blamed road conditions [1]. Malaysia is paying a heavy price due to road accidents, and the cost to the economy.

Successfully addressing the issue of driver drowsiness in the commercial motor vehicle industry is a formidable and multi-faceted challenge. A lot of research and experiments have been done in the last decade. Driver drowsiness detection techniques can be broadly classified into three categories: physiological measurement (such as brain waves (EEG), eye movements (EOG) and heart rate (ECG)), visual cues (such as eyelid movement, facial orientation, as well as yawning) and driving performance (monitor how the driver handles the vehicle) [2]. The first two categories monitor the driver's bio-signals directly, whereas the third category monitors the driver indirectly. The first category have to be attached to driver, making this approach both intrusive and impractical, the last two categories have non-intrusive nature. By reason of its non-intrusive nature, considerable accuracy and fully portability, the visual cues are the most widely used technique to detect the driver fatigue.

Object tracking is a fundamental and an important problem of dynamically extracting two-dimensional (2D) information in most visual applications including image processing, computer vision, video surveillance, human-computer interaction (HCI). With the proliferation of high-powered personal computers and portable and low-cost video cameras has brought forth a large numbers of algorithms in object tracking. There are many different approaches for tracking an object proposed to overcome the difficulties arising from noise, similar color distribution, and complex background environment.

The CAMShift tracking algorithms stands out as its simplicity and efficiency. CAMShift stands for Continuously Adaptive Mean Shift and it was first proposed by G. Bradski et al [3], aiming at efficient head and face tracking from a stationary camera in a perceptual user interface but has since been modified for a variety of other tracking situations[4][5].

The CAMShift algorithm was derived from the earlier Mean Shift algorithm [6] and is a simple, yet very effective, color-based tracking technique. It is proved by lot of proposed work. Bogdan kwolek [6] track human head and body respectively in order to tracking people. In

