Chapter 13
Real–Time Torpidity Detection for Drivers in Machine Learning Environments

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ABSTRACT

The World Health Organization (WHO) has conducted a survey on road accidents around the world. According to the survey, 13.5 lakh die each year due to road casualties and more concerning is that India accounts around 1.5 lakh road deaths every year. Major factors to blame on road accidents are driver carelessness, drowsiness, traffic discipline, vehicle faults, or even animal crossing. Different sensors, stability control systems, anti-breaking systems, navigation are added in the vehicles to make driving easier. Still, road accidents happen due to human mistakes. Drinking and driving and tiredness may cause a driver to go for torpidity. A machine learning system is developed to monitor the eye movements to detect if the driver is sleepy or not. If found, an alarm is issued to warn the driver to wake up or else to stop the vehicle and have a nap. In addition, if neither response is made, water sprinkling is automated on the driver's face.

INTRODUCTION

In the present scenario, advancement in technology has proved to be a great advantage as it has provided solutions for many complex issues in everyday life. This in turn has made work less exhaustive for employees, and it further enhances safety at work. Some of the popular applications uses vision based solution. Traffic monitoring, suspect detection, car parking camera are few such examples. These are complex systems. The vision based method is even used to detect vehicle operator (i.e. Driver), fatigue

(torpidity) or not. Torpidity causes human to lose concentration, as the person becomes tired, which leads to slow response time. Early signs of fatigue could pose a great threat, especially for the drivers.

Long-term concentration is essential in transport industry (pilots, steersmen, car driver, truck driver, etc.). These professionals should stay alert and act immediately to sudden events (Prakash Choudhary, 2016). Long hours of driving cause torpidity and leads to failed response. i). 30% of road accidents occur due to fatigue in drivers. ii). Studies reveal that a nap or poor concentration leads to road accidents. So, a technology is required to find driver's psychophysical status to reduce road accidents. The challenge lies in finding a technology, which should respond immediately.

Different sensors, stability control system, anti-breaking systems, navigation are added in the vehicles to make drivers effort easier. Still, road accidents happen due to human mistakes. Drunk and drive, tiredness may cause a driver to go for torpidity. Machine learning with vision based approach finds to be a good solution. A machine learning system is developed to monitor the eye movements to detect the driver is sleepy or not (Prakash Choudhary,2016; Cech, 2016; Yan, 2013; Marco Javier Flores,2009; Mohamed Hoseyn srigari, 2013; Fuletra, 2013; Tong, 2012). If found, an alarm is issued to warn the driver to wake up else to stop the vehicle and have a nap. In addition, if neither response is made, water sprinkling is automated on drivers face.

Background

At present, drowsiness or torpidity or fatigue for drivers is the main reason for road accidents which leads to rigorous wound or death added with considerable economic loss. Statistics reveals that a need for reliable detection system for driver's torpidity and alert mechanism before catastrophe. So, a machine learning technique is designed to detect and alert driver's torpidity (Yan, 2013; Marco Javier Flores, 2009; Mohamed Hoseyn srigari, 2013; Fuletra, 2013; Tong, 2012). Through this detection system, it is possible to avoid a number of road accidents by sending an alert to the driver with fatigue signs.

Driver drowsiness was detected using webcam (Chenyang Xu et al, 2013), eye pre-closure value calculation (Vaishnav Kshirsagar et al, 2019), IR LED sensors with microcontrollers (Manochitra, 2017), eye retina detection and pulse pattern detection (Chandrasena, 2018), Aurdino nano and eye blink sensors (Debasis Parida, 2021) . Alarming done using beagle board, hybrid approach, RF transmitter module (Chenyang Xu et al, 2013; Vaishnav Kshirsagar et al, 2019; Manochitra, 2017; Chandrasena, 2018; Debasis Parida, 2021) .The major objective of the literature survey focused to prevent accidents.

Existing System

The major reason for road accidents is due to driver's fatigue during driving. Hence, it has become vital to design an effective method to detect somnolence and alert driver.

Disadvantages

- Placing the system in a vehicle is inconvenient and one system for one vehicle is expensive.
- Only the drowsiness is detected and no method to alert.

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