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Driver Drowsiness Detection System

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Abstract— Driver fatigue is a leading cause of road accidents that leads to multiple fatalities and injuries annually. Fatigue refers to the difficulty of staying alert and awake, which may cause drivers to fall asleep while driving. This paper conducts a literature review of methods used to detect driver fatigue, such as examining physiological signals, facial features, and driving behaviour. Furthermore, a comparative study of recently published works is presented, evaluating accuracy, reliability, hardware requirements, and intrusiveness. The findings suggest that each technique has its own advantages and disadvantages. To maximize their benefits, a hybrid system that combines multiple techniques would be more effective, robust, accurate, and practical for real-time use.

Keywords— Current Detection, Current Detector, Current Detector Sensor, Current Monitoring.

I. INTRODUCTION

Driver inattention is the leading cause of most car accidents. One of the key factors that contribute to driver fatigue is lack of sleep or sleep disorders. This has resulted in an increase in the number of accidents on highways. To combat this, a drowsy driver alert system can be developed that detects signs of driver fatigue. Such a system would involve the installation of a camera inside the vehicle to monitor the driver's face and eye movements. When the system detects signs of drowsiness, it will send a warning signal to alert the driver. This paper covers the techniques used to detect eye movements and determine whether the eyes are open. The system should be unobtrusive and automatically turn on when the ignition is switched on. The driver should not be responsible for any system feedback. In addition, the system must function despite the face's color and texture. Additionally, it must be able to cope with a variety of situations, such as shifting lighting, shadows, reflections, etc. A technique for alerting drivers who are drowsy is suggested in the paper that uses both image processing and accelerometers.

In the last century, significant progress has been made in the automotive industry, resulting in more powerful, safer, energy-efficient, and environmentally friendly cars. However, despite these improvements, driver fatigue remains a leading cause of car accidents today. When driving long distances, exhaustion and fatigue can cause drivers to become drowsy or even unconscious, leading to an increased risk of accidents on the road. Unfortunately, the number of accidents is on the rise due to rapid growth in the number of vehicles on the road. Therefore, there is a pressing need to develop systems that can help drivers maintain their attention on the road. To this end, the Transport Research Wing of the Ministry of Road Transport & Highways in India is actively collecting information on traffic accidents.

The aim of this study is to develop a prototype for a drowsy driver warning system that can accurately track the driver's eye movements in real time. By continuously monitoring the eyes, early signs of driver fatigue can be detected, which can prevent accidents. Detection can be performed by analysing a series of photographs of the eyes, face, and head movements. Eye movements and their edges will be observed to detect drowsiness.

There has been extensive research and development in devices that can detect when drivers are falling asleep, warn them of the danger, or even halt the vehicle's movement. Driver fatigue is a serious problem, and hundreds of traffic accidents are caused by it every year. Due to the difficulties in determining the role of fatigue in accidents and assessing the level of tiredness, the exact number of sleep-related accidents is unknown. However, studies suggest that fatigue is responsible for up to 25% of accidents on monotonous roads in India, and research from other countries also highlights the significant issue of driver fatigue.

Shift workers, young male drivers, truck drivers, and business car drivers are among the most vulnerable groups to falling asleep while driving. However, any driver who travels a distance or drives while drowsy is at risk of having a sleep-related accident. Fatigue-related accidents are most likely to occur in the early morning and mid-afternoon, during long drives on monotonous roads, particularly on motorways.

The face detection and eye tracking algorithms used in this study have been developed for frontal faces without any backdrop limitations. The eye tracking method proposed in this study involves five stages, including constructing probability maps for the eye region using frontal photos from a database.

Driver alert systems and lane departure warning systems both rely on visual monitoring of lane markings to detect lane

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departures. However, driver alert systems are specifically designed to detect signs of driver drowsiness, while lane departure warning systems are intended to prevent lane deviation in any situation.

Unlike other systems that only trigger when a vehicle is at risk of veering from its lane, these systems monitor the driver's eyes and face for signs of fatigue. If the system detects that the driver is struggling to stay awake, it may make a correction to prevent an accident.

Facial image analysis is a research field with many applications, including face recognition, human identification security systems, and virtual tools.

In this study, the focus is on developing a prototype for a drowsy driver warning system, which involves accurately tracking the open and closed states of the driver's eyes in real-time. To achieve this, a self-developed image-processing algorithm will be used to extract the eye region from the face image, which will then allow for the detection of fatigue based on the eye state and head position. The proposed system can also address the issues of measuring driver fatigue and detecting distractions.

Continuous monitoring of the driver's eyes can help identify signs of drowsiness early enough to prevent accidents. This can be achieved by analysing a series of eye images, along with photos of the face and head movements. The detection process will involve observing the eye movements and their edges using the developed algorithm. In case the driver falls asleep, the system can send out a warning signal to prevent any accidents.

II. Literature Review

The classification of drowsiness detection techniques comprises three categories: physiological sensing, driver operation sensing, and monitoring of both driver and vehicle responses. According to research sources, strategies that focus on human physiology are the most effective. Intrusive and non-intrusive approaches are available, but intrusive methods, such as monitoring physiological changes, are more accurate but not practical due to the need for implanted sensing electrodes that can cause pain and harm to the driver. In contrast, non-intrusive techniques such as measuring posture, head position, eye state, blink duration and frequency, and saccade frequency are gaining popularity among researchers for their ability to obtain physical measures without interfering with the driver's usual condition.

Similarly, non-intrusive methods can also monitor driver and vehicle behavior by observing steering wheel movements, acceleration patterns, and vehicle speed and displacement. However, this approach has a limited window of time to correct the driver's drowsiness before a potential accident.

Another approach involves the driver's continuous monitoring of attentiveness by asking them to respond repeatedly to the system's prompts indicating their level of awareness. This method provides a continuous and periodic monitoring system that can alert the driver if their response time is delayed, increasing the frequency of the alert and ultimately sounding an alarm if necessary. However, this method can be tedious, uninteresting, and exhausting for drivers, leading to false alarms and drivers ignoring real problems. Nonetheless, companies have successfully integrated these approaches with other methods to create effective sleepiness detection systems.

III. PROPOSED METHODOLOGY

The existing system, it involves designing the current detection system. The system included the Arduino UNO, a Relay module, and a buzzer. The Arduino UNO is the main control center while the sensors measure the leakage current of the electrical appliance.

The current sensor ACS712 is used in this project that monitors the current flow and detects if there is any overloading or leakage of current through the circuit.

The relay module is used to automatically control the device which will automatically switch off the device at the time of any electrical hazard.

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