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### Arduino Based Automated Drowsiness Detection and Alert System

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**ABSTRACT**: Accidents occur during drowsy road trips on a daily basis; it is well known that many accidents occur due to driver fatigue and sometimes inattention; therefore, this research is primarily devoted to maximising efforts to detect drowsiness. The driver's condition under real-world driving conditions. The goal of driver drowsiness detection systems is to decrease traffic accidents. The goal of driver drowsiness detection systems is to decrease traffic accidents. The goal of driver drowsiness for detecting drowsiness, and several methods for detecting drowsiness or inattentive driving have been used. Our goal is to provide an interface where the programme can automatically detect the driver's drowsiness and detect it in the event of an accident by using the image of a person captured by the webcam and examining how this information can be used to improve driving safety.

**KEYWORDS**: Arduino, automated, alert, SMS.

#### I. INTRODUCTION

The Internet of Things (IOT) is the system administration of physical items that have gadgets embedded inside their design to communicate and detect collaborations among one another or with the outside environment. In the coming years, IOT-based innovation will offer advanced dimensions of administrations and, for all intents and purposes, change the way people live their daily lives[1]. Only a few of the absolute precedents where IOT is emphatically established are advances in prescription, control, quality treatments, farming, keen urban areas, and brilliant homes. Drowsy driving is a major issue in India. The dangers and often disastrous consequences of drowsy driving are alarming. Driving while drowsy is a dangerous combination of driving and sleepiness or fatigue. This usually occurs when a driver hasn't gotten enough sleep.

The main goal is to create a system that is accurate in detecting drowsiness in a driver based on eyelid movement and reliable in providing appropriate voice alerts in real-time. Other goals include developing a system that detects driver drowsiness by regularly monitoring the driver's eyes. When the driver's eyes are closed for a few seconds, the system should notify him. Poor lighting conditions have no effect on the system. The goal of this project is to create a drowsiness detection system based on eye tracking; it is hoped that symptoms of driver fatigue can be detected early enough to prevent a car accident. Fatigue is detected by observing eye movements and blink patterns. The drowsiness detection system's goal is to help prevent accidents involving passenger and commercial vehicles. The system will detect early signs of drowsiness before the driver has completely lost all attention and will warn the driver that they are no longer capable of driving safely[1].

#### II. RELATED WORK

K.Srijayathi [2] when drivers do not take breaks, they run a high risk of becoming drowsy. According to research, accidents are caused by sleepy drivers who need to rest, implying that drowsiness is a more common cause of road accidents than drunk driving. Attention assist can warn of inattentiveness and drowsiness over a wide speed range, as well as notify drivers of their current state of fatigue and driving time since the last break. It has adjustable sensitivity and, if a warning is issued, indicates nearby service areas in the COMAND navigation system.

ArunSahayadhas [3] his paper is about making cars more intelligent and interactive so that they can warn or resist the user in unsafe conditions and provide critical information in real time to rescuers, police, or the owner himself. Driver



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fatigue caused by sleep disorders is a major contributor to the rising number of accidents on today's roads. In this paper, we describe a real-time safety prototype that regulates vehicle speed in the presence of driver fatigue. The goal of such a mode is to advance a system for detecting fatigue symptoms in drivers and controlling vehicle speed to avoid accidents. In this paper, we propose a driver drowsiness detection system in which sensors such as an eye blink sensor are used to detect driver drowsiness.

MitharwalSurendraSingh [4] Driver drowsiness has been measured using the following methods: (1) vehicle-based measures, (2) behavioural measures, and (3) physiological measures. A detailed examination of these measures will provide insight into the current systems, issues associated with them, and improvements that must be made to create a robust system. This paper examines the three sensor-based measures and discusses the benefits and drawbacks of each. The various experimental methods used to manipulate drowsiness are also discussed. It is concluded that by developing a hybrid drowsiness detection system that combines non-intrusive physiological measures with other measures, the drowsiness level of a driver can be accurately determined. A number of road accidents might then be avoided if an alert is sent to a driver that is deemed drowsy.

Chisty [5] Based on continuously monitoring eyes and DIP algorithms, this project represents a method of developing an interface to detect driver drowsiness. Micro sleeps, which are brief periods of sleep lasting 2 to 3 seconds, are a good indicator of fatigue. Thus, by continuously monitoring the driver's eyes with a camera, one can detect the driver's sleepy state and issue a timely warning. The project's goal is to create a very advanced product related to driver safety on the road by utilising a controller and image processing. This product detects driver drowsiness and provides a warning in the form of an alarm, as well as reducing vehicle speed. Along with the drowsiness detection process there is continuous monitoring of the distance done by the Ultrasonic sensor. The ultrasonic sensor detects the obstacle and accordingly warns the driver as well as decreases speed of vehicle.

Seong G. Kong [6] Driver drowsiness is a major cause of traffic accidents. It is a serious issue for highway safety. Some of these accidents could be avoided if drivers were warned before they became too drowsy to drive safely. It is dependent on the presentation of timely drowsiness warnings to reliably detect drowsiness. To date, the inability of drowsiness detection methods to account for individual differences has limited their effectiveness. Drowsiness detection methods can be conveniently classified as intrusive or non-intrusive based on the type of data used . Non-intrusive methods detect drowsiness during the survey by measuring driving behaviour and sometimes eye features, with camera-based detection systems being the best method and thus useful for real-world driving situations . This paper reviews existing drowsiness detection techniques that will be used in this system, such as the Circular Hough Transform, FCM, Lab Color Space, and so on.

#### III. METHODOLOGY

Fatigue is a safety issue that has yet to be thoroughly or impressively addressed by any country in the world, owing to its nature. Fatigue, in general, is difficult to measure or observe, unlike alcohol and drugs, which have clear key indicators and tests that are readily available. The best solution to this problem is probably raising awareness about fatigue-related accidents and encouraging drivers to admit fatigue whenever necessary. The former is hard and much more expensive to achieve, and the latter is not possible without the former as driving for long hours is very rewarding. An IoT-based system is designed to avoid countless mishaps due to drowsy drivers' behavioural and psychological changes by focusing on driver's eye movements.[7]

Each year there are thousands of truck accidents, leading to injuries and fatalities, expensive insurance claims and lengthy traffic jams as wreckage is cleared. When a commercial truck is involved in a serious accident, the driver is usually the spotlight. Usually size and weights of trucks requires the driver to be both highly skilled & focused on controlling these multi-ton behemoths. Due to severity of injuries and property damage commercial truck accidents often produce large claim amounts. One of the most common fault of the truck driver is their failure in checking blind spots, known in the trucking industries as "no zones", before turning or changing lanes. They are on the all four sides of the semi, and many accidents happen when the trucker manoeuvres into the spots without carefully checking for clearance first. They are operating a dangerous vehicle, driving the rig defensively is part of truckers" "expanded duty" to protect us. Other truck driver errors are similar to those that anyone can make, such as not paying attention to surrounding, speeding, not knowing routes, exhaustion and driving under the influence of alcohol or drug This project involves controlling accident and saving driver's life as well as owner's problem of compensating every time even if it's the fault of the driver [8].

- 1. To develop a system that can automatically detect and perform appropriate immediate reaction based on different level of drowsiness.
- 2. Device monitoring the system.



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- 3. In short we can say whenever the driver feels drowsy his eyes starts to blink for more than one second, this status is detected by the IR sensor and the buzzer is blown to make the driver conscious and the text message is sent to the owner immediately.
- 4. Calculate the score to be verified. When the person is sleepy.

#### YawDD

The dataset "YawDD "(Yawning while Driving) is handed by the University of Ottawa, Canada. The dataset consists of two sets of vids that are recorded using two different locales of camera inside a auto. For one set, the camera is placed on the dashboard of the auto while for the other set, the camera is placed just underneath the frontal glass of the auto. Further, there are multiple motorists( manly and womanish) in the vid- eos. All the possible conditions that a motorist may be subordinated to are present in the vids. This includes motorist with spectacles, motorist without spectacles, smiling motorist, nudnik - ing motorist, drowsy motorist and the motorist while looking around.

The vids in the given dataset are recorded in 640x480 24- bit true color( RGB) 30 frames per second( fps) AVI format without audio. The total data size of the data is about 5 GB. In addition, no reflections were available for this dataset.

For this dataset, we uprooted around 600 frames from all of the vids. Each indi- vidual frame uprooted was also labeled by hand as reflections weren't handed [9].

#### **Closed Eyes in the Wild (CEW)**

Department of Computer Science and Technology, Nanjing University of Aeronautics and Astronautics, China, collected the dataset closed eyes in the wild. Closed Eyelids in the Wild is a dataset that contains all photographs of persons with closed eyes.

The photographs are in JPEG format. A total of 1192 photos, weighing in at around 21 megabytes, are available. In our dataset, we used 137 photos from the available photographs. Furthermore, there were no reflections available for this dataset. We hand-labeled each image in the Closed Eyes in the Wild (CEW) collection because reflections were not available[10].

#### Custom Images Used

In addition to the datasets given above, our training dataset included images gathered from other image databases via a web search. The images used were free to use and open-source. The goal of incorporating such photographs into our training dataset was to improve it. We chose photographs to ensure that our dataset included a variety of lighting conditions, positions, and was more diversified [11].

The photographs are in JPEG format. A total of 2691 photos are available, weighing in at around 235 megabytes. There were no annotations available for these photographs because they were acquired from separate websites. We hand-labeled features in the photos for training purposes in this dataset [12].



Fig: Drowsy Dataset images[12]

#### **Training Methodology**

The notion of transfer literacy was used because the obtained dataset did not have enough training images to train the object discovery frame from scrape. From the TensorFlow Object Discovery model zoo, a MobileNet- SSD model pre-



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trained on the MS COCO dataset was taken and fine-tuned on the FDDB dataset to detect Face and Eyes in the image. After that, we developed the dozyness detection system by further training this model on our unique Drowsy dataset[13].

System	Sensors/Parameters	Algorithm	Accuracy
[1]	EEG, ECG	Mean power frequency	-
PODS [3]	Respiration Rate, Heart Rate, Heart Rate Variability	Power Spectrum	
[4]	Cameras/Eyelid movement, gaze movement, gaze movement, head movement and facial expression	Kalman filtering tracking	Yawn–82% PERCLOS–86% AECS–95%
[5]	IR Camera	Thresholding, Mean	-
[6]	Camera/facial features of eyes, mouth and head	Fuzzy reasoning	Only focused on detection rate for facial tracking and face tracking rate
BCI [9]	EEG	Principal Component Analysis (PCA)	Training–92.6% Testing–74.6%
[11]	ECG, EEG	dynamic Bayesian network, first-order Hidden Markov Model	Drowsy (best)–91% Active (best)–91%
IVIS [15]	Eye movement, driving performance data	Support Vector Machines (SVMs)	Distraction detection (average)-81.1%

#### IV. RESULTS AND COMPARISON

Table.overview of existing drowsiness systems developed by researchers

illustrates the overview of existing drowsiness systems developed by researchers. Some researchers are focusing on identifying the regions in which fatigue or drowsiness may occur but are less concentrated on identification of performances in the long term[15].

#### **V. CONCLUSION**

The proposed device in this evaluation provides accurate detection of driver fatigue. The evaluation and design of a driver drowsiness detection device is presented. The proposed device is used to avoid numerous road accidents caused by drowsy driving, and it can also assist drivers to stay awake while driving by providing a warning when the driver is sleepy. The basic idea behind a drowsiness detection device is that it detects and provides information about behavioural, vehicular, and physiological parameters based entirely on it. Drivers appear to yawn less frequently in the moments preceding falling asleep, no longer more frequently. This emphasises the importance of using examples of fatigue and drowsiness situations in which topics undoubtedly fall asleep. Despite the fact that the accuracy cost of using physiological measures to detect drowsiness is high, they are quite intrusive. Our project's goal is to assist in the resolution of real-world problems in a cost-effective manner. It notifies both the truck driver and the company's owner. The buzzer sounds whenever the driver becomes drowsy and closes his eyes for more than a second. As a result, the driver is notified. It also sends text messages to the truck driver's owner to warn him. As a result the accident ratio decreases. Hence, our project if commercially developed will help in saving the precious life of truck driver & money of the owner.



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